PRODUCING FARM LIVESTOCK

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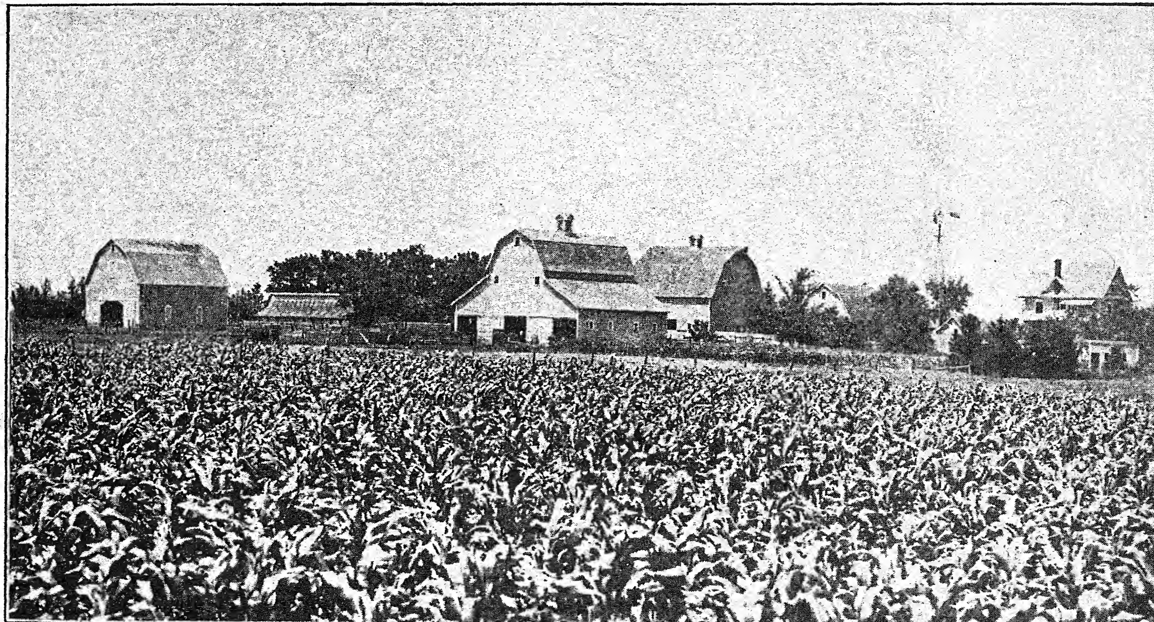

Frontispiece *Photo by Allen*

A STOCKMAN'S REWARD

This farmstead and the fertile fields about it are not due to grasping "the skirts of happy chance" but to the strong faith of a man in livestock farming. Livestock farmers by intelligent planning, wise direction, and skillful execution have developed the highest type of permanent agriculture to be found.

PRODUCING FARM LIVESTOCK

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PREFACE

This book seeks to provide for the student in agriculture a presentation of the most approved present-day methods in the production of beef and dairy cattle, horses, sheep, and swine. It is hoped that the material will also be of value to those who are already engaged in livestock production but whose experience may still be limited. Whatever class of livestock is kept, intelligent planning, together with right methods of care and management, will help to increase the efficiency of the enterprise.

The wide distribution among vocational school students accorded previous books of the Wiley Farm Series has prompted the continuation of the plan of presenting the subject matter on the operative basis; that is, in the form of the actual procedures, step by step, as they are taken up in practical livestock production. This has seemed to be the most satisfactory form both for classroom study and for use in the organization of school and home projects, as well as for quick reference by the busy livestock farmer.

This book strikes a distinct note in placing emphasis on the managerial or organization point of view. A complete section is devoted to a discussion in detail of the factors involved in the establishment and organization of successful livestock enterprises, stressing the fact that no one enterprise can thrive at the expense of others, but that the success of the organization as a whole must be kept in mind. Too often the student is confronted with only a compilation of minor operations of daily routine so disconnected that he misses the broader viewpoint and fails to see the possibilities of success of the organization as a whole.

The authors express their appreciation of the assistance of Miss Florence E. Smith in the critical reading of the manuscript.

The Editors and Authors.

SUGGESTIONS TO TEACHERS

An attempt has been made to discuss briefly the more important problems in the production of farm livestock. Lack of space prevents the treatment of each of these subjects fully, and also makes it necessary to leave many phases untouched. It is expected that the teacher will supplement the material in the text with assigned readings and field trips. A number of references together with community and farm studies are appended to each chapter. These are merely suggestive. Each teacher can readily prepare others particularly suited to the conditions in his own community.

Inspection trips are usually made to best advantage by the class as a group, rather than as individual members. These trips should be under the leadership and guidance of the teacher and made only to those farms and establishments which have been found on previous trips or by a personal visitation of the teacher to be well suited to illustrate the particular lesson being studied. As a rule, the consent of the farmer or manager and his willingness to cooperate are essential to a successful inspection trip. Not all farms or establishments visited need show good methods. Occasionally, the contrast of good and poor methods is the most forceful way of teaching a lesson.

A casual inspection of the livestock, feeds, barns, equipment, or methods means but little to the student. Every trip should be carefully planned with the objects of relating some fact studied in the classroom to livestock practice and of stimulating each student to develop independent thinking with regard to the application of the things seen to conditions on his home farm. Detailed reports following outlines prepared by the teacher are recommended. In these, each student should

endeavor to develop his own ideas with regard to the soundness of the methods observed and the applications to his own livestock enterprises.

A careful reading of the different chapters will disclose suggested methods and problems in the case of one class of livestock which are not found in connection with all classes. Some of these suggestions for work may be readily applied to more than the one class of stock.

The references at the end of each chapter are intended merely as suggestions. It is expected that the teacher will supplement them by the publications from his own state agricultural experiment station. Since the supply of these often becomes exhausted or a publication is replaced by a revised edition with a new number, specific mention of but a few experiment station publications has been made. It is suggested, therefore, that the teacher keep a complete file of the available livestock publications of his own state in the school library and from time to time send for a list of available publications of other state agricultural experiment stations. A large number of excellent bulletins and circulars are available. As a rule, the popular bulletins, circulars, and club publications will be found most useful and the technical bulletins of least value from a teaching standpoint.

CONTENTS

INTRODUCTION

THE STUDY OF FARM ANIMALS

Livestock production holds an important position in the agriculture of the United States. Of the entire agricultural income for the country in 1938, cattle, hogs, and sheep accounted for approximately one-fourth; and if the income from milk is included, the amount is increased to over 45 per cent. If the income from poultry and eggs is also included, more than half the agricultural income of the nation is accounted for. Consideration should also be taken of the power obtained through the use of horses and mules on the farms. This of course is not usually a direct source of cash income, but it does affect the returns secured so far as these animals supply the major portion of power on the farms.

Livestock production is also of major importance because of the relation it bears to commerce. The value of animal products in domestic and foreign trade amounts to enormous sums annually. For many years the value of packing-house products exceeded the value of the products of any other industry in this country. Furthermore, the commerce arising from livestock and its products provides work for many people in the cities.

Since the production of livestock is of such major importance in the agriculture of the country, it is readily seen that it can be made to contribute much to the successful operation, management, and income of the farm. Farming is a complicated organization including many activities, such as the maintenance and improvement of the soil fertility, the growing of crops of high quality and yield, the intelligent use of machinery, the efficient marketing of farm products, as well as the participation in agricultural organizations. In studying livestock

production, therefore, it must be remembered that it is only one of a large number of activities, and that the interrelation of these activities must be considered as well as the efficiency of any one alone. If the entire farm business is to be profitable, each activity must be made to contribute to the success of the others. The organization of these various enterprises on the farm is a task which will demand much attention, time, and effort on the part of the manager, and one which will call for his full abilities.

In preparing this text, an effort has been made to present the subject of livestock production as a whole, including not only the procedures necessary to make production in itself successful, but also those necessary to give it its proper relation to the other activities of the farm. Most of the discussions concern the advisability of following certain procedures which may increase the financial rewards to be secured. Thus the main emphasis has been placed on the large problems confronting the livestock producer. In a number of cases directions are given for performing specific operations.

Livestock production is to some extent the business of the specialist, but it is so closely interrelated with good farming practice that the problems are discussed from that standpoint as well as from the standpoint of good livestock husbandry. In doing this it is realized that conditions on farms vary greatly and that it will be necessary for each student to decide on the value of the information for his own particular farm. In many cases minor modifications will very likely be advisable. However, the fundamental principles of livestock production remain constant under all conditions.

It will be of great advantage to the student if he can arrange to carry on various livestock projects while he is studying the text, for it is in the use of knowledge that its value lies. There is probably no better way of making the lessons of the classroom vital and lasting than by the use of projects. As the material in this text is discussed in the classroom an effort should be made, if it is at all feasible, to consider the specific

problems on the farms of the members of the class and to work out opportunities for improvement. For example, how do the methods of procedure used on those farms compare with the methods suggested in the text? Will a change in the arrangement of the barns and lots make it possible to improve the care of the animals and reduce the time and effort required to give this care? Will a change in the pastures improve the animals' health and increase the feed supply? If it seems probable that these or similar changes will result in improvements, then discussions should be held as to the best methods of accomplishing them.

In considering the possibilities of livestock production as a career, its risks must be remembered as well as its advantages. Undoubtedly it is an occupation which develops those qualities of character which can give one prestige in his community. There is also the possibility of considerable financial reward. But it will require high intelligence to keep the risks at a minimum and to hold the capital investment within practical limits. There must be knowledge to comprehend, judgment to decide, understanding to direct, and skill to do.

The young man who desires to become a successful livestock producer must understand:

1. The contribution livestock may make to profitable farming.
2. The principles involved in raising farm animals.
3. The procedures necessary to enable his animals to do well the things for which they are kept.
4. The fact that good animals efficiently handled may contribute much to the enjoyment of farm life.

PRODUCING FARM LIVESTOCK

Part I.—ORGANIZATION

CHAPTER I

ESTABLISHING AND ORGANIZING A LIVESTOCK ENTERPRISE

Before setting out to engage in the raising of any class of livestock it is well to have clearly in mind the objects for which such animals are kept. Far too often herds are founded for no well-thought-out reason save that other men have found them profitable and hence such herds must be successful and profitable for everyone who undertakes their production. Unfortunately, such is not the case. Conditions affecting the production of livestock vary from farm to farm and it is not safe to assume that one should engage in the raising of hogs, cattle, or sheep simply because one or more of his neighbors have prospered through producing such animals. Livestock, like all other items of equipment, should be kept to accomplish a well-defined purpose which cannot be realized successfully without it. Until this purpose is thought out and stated in concrete form, it is impossible to progress far in determining the class, type, or number of animals to keep.

Management Problems:

1. Determining the objects in keeping livestock.
2. Choosing a livestock enterprise.
3. Considering the probable demand or market outlook.
4. Taking a long-time outlook.

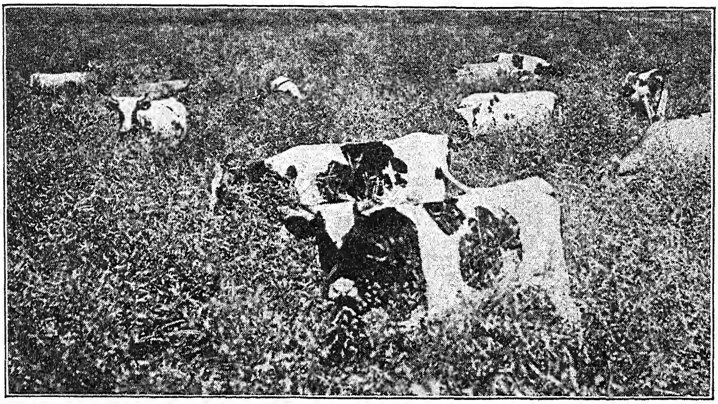
5. Starting a livestock enterprise.
6. Choosing the breed.
7. Buying foundation stock.
8. Making additions to the herd.
9. Starting a feeding enterprise.
10. Preparing a plan of marketing.
11. Keeping and evaluating records.

1. Determining the Objects in Keeping Livestock.—Following are the chief purposes which animals serve on the so-called general, all-purpose farm:

Considerations:

(*a*) Utilization of pasture crops.
(*b*) Utilization of large quantities of unmarketable roughages.
(*c*) Insurance of a basic market for grain and hay.
(*d*) Utilization of man and horse labor.
(*e*) Conservation of the fertility of the soil.
(*f*) Greater diversification of the farm business.

(*a*) *Utilization of Pasture Crops.*—The possibilities of pasture crops as a means of adding to farm income through livestock should not be overlooked. In the level prairie regions, where most of the land is suitable for cultivation, there is a relatively small percentage of farm land in permanent pasture, but the temporary pasture crops are numerous and extensive because of their being included in the crop rotation. On a well-managed farm where the upkeep of the soil is being considered, legume crops such as red and sweet clover will occupy from 20 to 30 per cent of the area in cultivation. Through wise pasturing, advantage can be taken of these legume crops without seriously interfering with their value as soil builders, and in this way much profit can be obtained in the production of valuable livestock products. In rolling sections, such as are found along streams, pastures frequently constitute over half the total farm area.



Courtesy of University of Illinois

FIG. 1.—DAIRY COWS AND HEIFERS ON SWEET-CLOVER PASTURE

Livestock affords a way to utilize legume crops grown in the regular rotation.

TABLE 1

EXTENT OF PASTURE IN THE GENERAL FARMING AREA OF THE UNITED STATES *

	Average Pasturage Acreage per Farm			Percentage of Total Farm Area in Pasture		
	Plowable Pasture	Woodland and Other Pasture	Total Pasture	Plowable Pasture	Woodland and Other Pasture	Total Pasture
	Acres	*Acres*	*Acres*	%	%	%
Illinois	17.8	14.5	32.3	13.0	10.7	23.7
Indiana	14.0	15.3	29.3	13.7	15.0	28.7
Iowa	24.1	20.3	44.4	15.5	13.0	28.5
Missouri	26.3	24.7	51.0	21.0	19.7	40.7
Ohio	16.3	16.9	33.2	18.0	18.6	36.6
Middle Atlantic States	9.5	19.9	29.4	10.4	22.3	32.7
East North Central states	13.5	20.3	33.8	12.6	19.8	32.4
West North Central states	32.0	49.6	81.6	14.4	22.2	36.6
United States	17.8	46.2	64.0	12.3	31.8	44.1

* Compiled from U. S. Census of Agriculture, 1925.

(*b*) *Utilization of Large Quantities of Unmarketable Roughages.*—In the common corn-belt rotation of corn, corn, oats, and clover, approximately 1¾ tons of roughage is produced for every ton of grain obtained. The roughage from the corn crop is wholly unsalable and the oat straw and clover hay are often hard to dispose of at remunerative prices, especially if damaged by rain or by the presence of weeds. However, all these materials constitute good feeds for livestock if properly combined with other feeding stuffs, and when so fed they will usually return to the farmer far more than their market value. It has been estimated that the total quantity of straws and stovers produced annually in the United States would, if fed alone, theoretically maintain 30 million mature cattle through a six months' wintering period. At present only about 27 per cent of such roughages is fed, which means that many farmers are failing to realize the additional profit that might be had through the handling of livestock.

(*c*) *Insurance of a Basic Market for Grain and Hay.*—The quantity of grain which can be disposed of for milling and other commercial purposes is exceedingly small compared with the total amount grown. Probably not more than 8 per cent of the corn, 5 per cent of the oats, 20 per cent of the barley, and 25 per cent of the rye produced in the United States is bought by mills to be converted into products suited for human consumption. Moreover, with the exception of rye, very small percentages of these grains are exported. The rapid replacement of horses by cars and trucks in our towns and cities has resulted in a significant reduction in the demand for grain, hay, and straw for city work horses. Hence, the only reliable outlet for the great bulk of our coarse grains and hays is furnished by the animals either on our own farms or on the farms in other parts of the country. If, for any reason, any of our important species of livestock should decrease below its present numbers without a corresponding decrease in the principal crops which these animals consume, a burdensome surplus of such crops would immediately develop. This very condition has occurred

in the case of oats and timothy hay, which have sold at very low prices since the recent marked decrease in the number of horses and mules. In fact, there are some authorities who say that the farmers in large part brought the agricultural depression of 1925–1932 upon themselves by diverting some 10 million acres of land formerly used in maintaining their work animals to the production of grain for the cash market.

In the milling of wheat, rye, and barley a considerable percentage of the original weight of the grains is represented by the bran, middlings, brewers' dried grains, and other mill products. These materials are valuable feeds and the prices which they command for feeding purposes have a marked influence upon the prices which millers can afford to pay for the whole grains.

Thus the market prices of our major farm products are determined to a large extent by the return which can be realized when they are fed to livestock. Should the cash price of grain and hay temporarily exceed their feed value, livestock farmers will at once proceed to contract their feeding operations. This action, of course, will quickly bring about higher market prices for livestock and correspondingly lower prices for grain, so that the feeding of these crops will again become more profitable than selling them for cash.

(*d*) *Utilization of Man and Horse Labor.*—Farmers have not only crops to utilize and market but labor as well. This labor consists of that of the owner or operator, his family, his employees, and that of his horses. Maximum returns are possible only when all available labor is profitably employed on every working day. Undoubtedly, one of the reasons for the economic distress so prevalent in certain sections of the country where only cultivated crops such as cotton, wheat, or corn are grown, is the failure of the farmers and their families to work at productive tasks during a considerable portion of the year. If, during the otherwise idle season, such men by feeding cattle or milking cows should make but 20 cents an hour for five hours a day, this extra income would amount to

the tidy sum of $180 over a six months' period. If in addition to the labor of the owner, two hours of remunerative labor a day is provided for a team, this labor at 5 cents per horse-hour will bring the total to $216. Such labor requirements are typical of those involved in the winter feeding of a single load of cattle and the milking of a half-dozen dairy cows. The accompanying table, showing the labor distribution on an Illinois livestock farm, indicates clearly that a livestock enterprise may be so organized as to interfere but little with field work during the spring and summer months and emphasizes the possibility of making profitable use of labor through a combination of livestock and grain operations.

TABLE 2

MAN AND HORSE LABOR USED IN FEEDING BEEF CATTLE IN THE VARIOUS SEASONS OF THE YEAR *

	Man Labor Expended		Horse Labor Expended	
	For Cattle	For Total Farm	For Cattle	For Total Farm
	Hours	*Hours*	*Hours*	*Hours*
January–March	440	1,725	559	2,044
April–June	110	3,049	107	5,252
July–September	1	3,193	......	3,477
October–December	220	2,288	245	3,658
Total for the year	771	10,255	911	14,431
Percentage of labor in fall and winter	85.6	39.1	88.2	39.5

* Illinois Agricultural Experiment Station Bulletin 261.

(*e*) *Conservation of the Fertility of the Soil.*—It is generally recognized that one of the advantages of livestock is the conservation of the fertility of the soil. One hundred bushels of

corn sold to the elevator represents a loss of approximately 100 pounds of nitrogen, 17 pounds of phosphorus, and 19 pounds of potassium, whereas, if this corn be fed to livestock from 60 to 90 per cent of the plant food elements will be recovered in the manure. Moreover, the plant food contained in farm manure is readily available so that its stimulating effect upon plant growth is considerably higher than its chemical composition would indicate.

Not only do animals aid directly in maintaining the fertility of the soil through restoring to the land a high percentage of the

Courtesy of University of Illinois

FIG. 2.—A COMPOST PILE IN THE MAKING

Under such conditions livestock is the source of large quantities of valuable fertilizer and is a great aid in maintaining the productiveness of the soil.

plant food elements contained in the feeds eaten, but they also aid indirectly by encouraging the growth of a much larger acreage of legume pasture and forage crops than would likely be grown under a grain system of farming.

(*f*) *Greater Diversification of the Farm Business.*—In these days of keen competition and small margins considerable diversification of enterprises is necessary to insure a reasonably regular income regardless of fluctuations in supply and demand

and variations in weather conditions. Thus, a farmer who is producing wheat, sugar beets, hogs, butterfat, poultry, and fruit is not so likely to be financially embarrassed by the failure of his wheat crop or the collapse of the hog market as his neighbor who derives 80 or 90 per cent of his income from one of these sources. Farm animals are particularly well adapted to diversified farming: (1) because of the great number and variety of livestock products for which there is a steady demand; and (2) because livestock makes possible a highly diversified cropping system through its ability to utilize the unsalable portions of many crops.

2. Choosing a Livestock Enterprise.—The six advantages enumerated above do not apply to all livestock enterprises with equal force. Hence, before deciding to start a specific livestock project, one should make a careful study to see whether or not it is well adapted to the conditions existing on his particular farm. For example, if the principal object sought in livestock production is the utilization of surplus forage crops, one will not be likely to accomplish his purpose by producing hogs, since hogs are capable of consuming relatively little roughage. Similarly, if the principal aim is the utilization of idle labor, beef cattle will not be a good choice since they require less labor in proportion to their value and to the amount of feed eaten than almost any other class of animals. In short, the object for which livestock are kept will determine not only the species or kind of animals to buy, but also the plan of management that should be followed if they are to be most profitable. Pending a more detailed discussion of this subject in the chapters which follow on the special classes of livestock, a general idea of the suitability of the different species of animals for a particular purpose may be obtained from the accompanying table.

3. Considering the Probable Demand or Market Outlook.—While the adaptability of the farm for a particular livestock enterprise is of paramount importance, this alone will not insure financial success. In addition there must exist a favor-

TABLE 3

Adaptability of Animals for Realizing Objects of Livestock Production

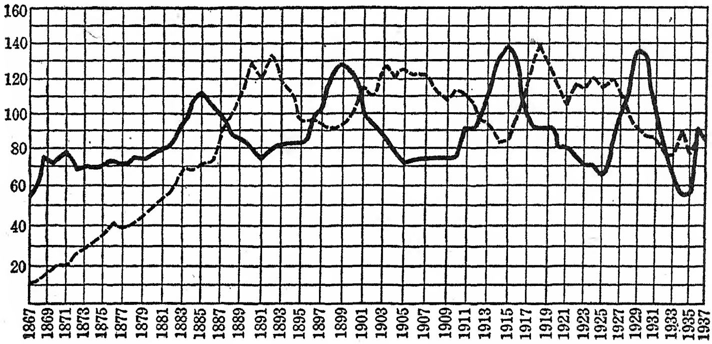
Object Sought	Dairy Cattle	Beef Cattle	Hogs	Sheep	Horses	Poultry
(a) Utilize pasture crops.....	Good	Excellent	Fair	Excellent	Fair	Poor
(b) Utilize harvested roughage..................	Excellent	Good	Poor	Good	Fair	Poor
(c) Utilize grains and mill products.............	Good	Good	Excellent	Fair	Good	Fair
(d) Utilize labor...........	Excellent	Fair	Good	Fair	Fair	Good
(e) Conserve soil fertility....	Excellent	Good	Fair	Good	Fair	Poor
(f) Make for diversification..	Good	Fair	Fair	Good	Fair	Good

able market for the salable products. In the case of ordinary beef cattle and sheep, which can be shipped long distances, favorable market facilities are of relatively little importance. However, perishable products, such as whole milk, sweet cream, and dressed meats, must be produced sufficiently close to market to insure their delivery to consumers in first-class condition. Occasionally, unusually poor railroad or highway facilities will impose a serious handicap upon a livestock enterprise of a community and make it very impractical. On the other hand, good means of transportation or low freight rates may make a certain region very favorable from the market standpoint. A good example of the latter condition is to be found in the large cattle-feeding areas in northern Illinois, where the important railway lines crossing the state offer "feed-in-transit" privileges on feeder cattle billed from the range states straight through to Chicago. Frequently the saving in freight thus effected amounts to nearly $50 a car.

In establishing highly specialized types of livestock production, such as "hot-house" lambs, "new-laid" eggs, "home-killed" meats, as well as in the production of purebred livestock, the probability of satisfactory market outlets should receive careful consideration. The interest of the general public in such articles is likely to be too fickle and uncertain to rely upon

the usual market agencies in disposing of these products. Unless satisfactory means of marketing have already been built up by other farmers of the locality and a reasonably steady demand assured, the beginning stockman had better delay these highly specialized tasks until he has gained considerable experience in producing ordinary livestock for the open market.

4. Taking a Long-time Outlook.—Consideration should be given to the probable advantages and disadvantages of a



Courtesy of Armour and Company

(Heavy line = buying power of cattle;
broken line = receipts of cattle at Chicago;
100 = average of 5-year period 1910–1914).

FIG. 3.—THE BEEF-CATTLE CYCLE

Livestock production and prices rise and fall throughout fairly uniform periods, which are approximately eight, three, and two years for beef cattle, sheep, and swine, respectively. Knowledge of the probable future price trend is of great importance in considering the establishment of a herd.

proposed enterprise over a series of years rather than merely to the benefits to be derived in the immediate future. One of the important differences between livestock and grain production is that with livestock more time is required to get the business well established. Frequently, two or three years must elapse after the founding of a herd before much income is derived from the sale of surplus stock. This is especially true of cattle and horses because of their slow rate of reproduction. Moreover, the closing out of a livestock enterprise is likely to entail considerable sacrifice in the forced sale of valuable

breeding animals and in the alteration of buildings and equipment designed especially for a particular class of animals. For these reasons, the continual shifting from one kind of livestock production to another is almost certain to end in financial disaster.

5. Starting a Livestock Enterprise.—Having decided that conditions are favorable for establishing a livestock enterprise, one is next confronted with the question of how to begin. Much care and caution are in order here as mistakes at this point are likely to be costly both in time and money. Starting in the right way involves much more than purchasing a few breeding animals. Ofttimes it includes the changing of the rotation, the rearrangement of fields, the alteration and construction of buildings and equipment, and so forth. The doing of all of these things necessarily requires time, and the young breeder, in his eagerness to start operations, is prone to postpone them until after the herd is established. Nevertheless, better results will be obtained if a reasonable attempt is made to get the farm ready for the animals before they arrive.

6. Choosing the Breed.—In some respects it is unfortunate that we have several breeds of animals of the same general type, since many men waste considerable time in debating which one is best suited for their particular purpose. As a matter of fact, the differences between breeds are not sufficiently great to make any large difference in the final outcome of the enterprise. In special situations, of course, such as the production of "country" butter and "hot-house" lambs, the breed chosen is very important and more will be said on this subject in the chapters which follow. Usually, however, the safest course to follow is to choose the breed which predominates in the community, for by so doing advantage may be taken of the experiences already gained by other farmers. The very fact that a breed is prominent is a good indication that it is well suited to the conditions of the locality.

7. Buying Foundation Stock.—The purchase of the initial animals to establish a herd is a matter of major importance, as

they constitute the seed from which future generations of animals will be produced. In selecting individuals for this purpose, preference should be given to nearby herds in order that information may be easily obtained concerning the general health and breeding efficiency of the animals and the honesty of the seller.

Grades vs. Purebred Females.—Only a small number of our farm animals are purebred or registered stock. On the other hand, nearly 90 per cent contain a sufficiently high concentration of improved blood to permit their being classified as belonging to one of the recognized modern breeds. While a great many of these grade animals have little claim to breed recognition save color, a considerable number are the product of so many generations of improved breeding as to render them almost equal to purebreds so far as their value as market animals is concerned. Particularly is this true of the beef cattle and hogs of the range and corn-belt states, where the common practice is to use generation after generation some one breed of purebred sires with but few or no female additions to the herd.

As a rule, grade rather than purebred females should be purchased by the beginner breeder. Owing to their much lower cost, less capital will be required and less risk incurred over the initial three or four years, during which experience is being gained in the management of the herd and money accumulated for an expansion of the business. However, the man whose chief interest and ambition is to be a breeder of pedigreed stock may well include in his initial purchases two or three moderate-priced purebred females, the offspring of which will gradually replace the grades. Numerous instances are on record where the purchase of a single registered gilt or a cow, rebred and with heifer calf by her side, has constituted the sole foundation of a very successful purebred herd.

The Herd Sire.—Frequently in establishing a breeding herd too little money is reserved for the purchase of a high-class sire. While the outlay for a sire should, of course, be determined by

the degree of merit possessed by the females, in general it should be from two to four times the average value of the females. Only by the use of sires which are outstandingly superior to the rest of the herd is rapid and permanent improvement likely to be effected.

8. Making Additions to the Herd.—As a rule, the establishment of a high-class breeding herd requires considerable time. Better results are to be expected from a herd which is built up over a series of years from a few carefully selected animals than from a herd bought ready-made from a breeder retiring from business or from a varied collection of animals assembled from far and near with but little regard to their uniformity of type, breeding, or productiveness. In the former case further additions to the herd will not likely be necessary; while in the latter, heavy culling will call for further purchases. Herd sires, of course, must be bought from time to time to prevent the too close mating of related individuals, but the continual purchase of females is in reality an admission on the part of the breeder that his herd is slipping backward and needs outside help. Unless a breeder can breed females sufficiently good for his own herd, there is little likelihood that other breeders will consider them good enough for theirs.

9. Starting a Feeding Enterprise.—Thus far the discussion has centered largely about the problems involved in establishing a breeding herd. Some of the most extensive livestock operators, especially of the corn-belt states, are known as feeders rather than breeders. They do not attempt to raise their animals but buy them at weaning ages or when about half-grown and fatten them for market. This is especially true in the case of beef cattle and sheep, which are bred in large numbers in the western states and sold to corn-belt farmers for feeding purposes.

While feeding and breeding enterprises have much in common, it is obvious that they must differ greatly in many respects. In the first place they differ greatly as to the period of time over which they extend. As stated above, a breeding

project is built up slowly and must be continued over several years in order to attain any high degree of success. A feeding project, on the other hand, can be started almost in a day, and, as a rule, ends after a period of from 4 to 6 months with the marketing of the fat animals. However, it should be said that the feeding of a single drove of cattle or sheep should hardly be termed a feeding "enterprise." Rather, it should be designated a "project" and the term "enterprise" used to indicate a well-planned system of buying, feeding, and selling

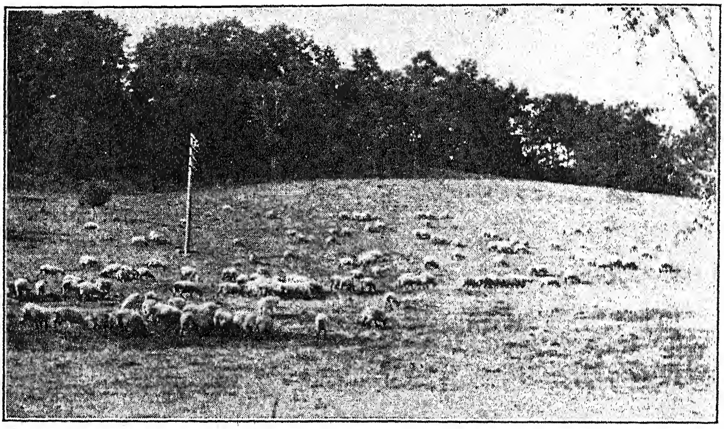


FIG 4.—A HILLTOP PASTURE

Livestock makes possible an annual income from large areas of rough and rolling land which cannot be tilled successfully.

a certain class of animals over a considerable period of years. Such a plan will involve the adjustment of rotations, the arrangement of fields and buildings, and the distribution of labor and other factors of production so as to make the individual feeding projects key into the general plan adopted for the farm as a whole. In this respect the feeding and breeding enterprises are exceedingly alike.

Owing to the fact that most feeding enterprises start out ready-made, so to speak, and involve the purchase rather than

the breeding of the animals involved, more capital is necessary at the start than is usually invested in founding a breeding herd. However, since this capital will be released when the animals are marketed after a few months of feeding, banks and other credit corporations are much more ready to grant loans for feeding than for breeding ventures.

For tenants whose stay on a particular farm is more or less temporary, a feeding enterprise has the advantage that it can be closed out without the sacrifice that is likely to attend the forced sale of a valuable breeding herd. On the other hand, the yearly or semi-yearly purchase of thin animals in the expectation that they will be sold for a higher price than they cost, involves an element of speculative risk almost absent in a breeding herd where the animals offered for sale represent little direct outlay of money, but are as truly the products of the farm as grain, hay, or dairy products.

10. Preparing a Plan of Marketing.—A careful, systematic plan of marketing livestock and livestock products is just as much a part of a livestock enterprise as the feeding and care of the animals themselves. In the past this point has been frequently overlooked, but with the recent establishment of better marketing facilities, it is receiving more attention. Its importance relative to the other factors already discussed is suggested by the special treatment accorded the subject of marketing in Chapter XIX of this book.

11. Keeping and Evaluating Records.—Any enterprise sufficiently large to engage the attention of the farmer is deserving of an accurate account of its progress in the form of detailed written records. Particularly is this true of the livestock enterprise which includes numerous transactions involving, in many cases, thousands of dollars. Only by means of such records is the owner able to know whether or not his animals are returning a profit or what changes in his plan of management are advisable in order that savings in feed, labor, and other expenses of production may be made.

Financial records are by no means the only records neces-

sary on the livestock farm. In addition, careful records should be kept of the identity, breeding, and productivity of all breeding animals. Only when such records are kept can intelligent culling be made when it is necessary to dispose of part of the original herd to make room for young females of promise. Too often the breeder relies solely on his own memory for such information, overlooking the possibility of a long absence from home, on account of sickness or business, which would result in considerable confusion of identity, particularly among the younger animals which have grown up in the meantime. Instances have occurred where excellent purebred animals have been reduced to the value of ordinary market stock by the sudden death of their owner who left no written records whereby they could be identified.

In addition to the above records, which are of a general nature, special records showing the daily milk production and feed consumption of each cow are common in the case of dairy cattle. Also, in the case of fattening animals, data regarding rations fed and gains made by weekly or monthly periods are highly desirable.

FARM AND COMMUNITY STUDIES

1. What livestock enterprise carried on in your community seems to accomplish to the highest degree the utilization of available pasture crops?

2. In like manner determine the enterprise which best accomplishes each of the remaining objects in keeping livestock listed near the beginning of this chapter.

3. What livestock enterprises would appear to be well adapted to the locality in which you live? Why?

4. What livestock enterprises are not especially well suited to your community? Why?

5. Replacing the names of the states in Table 1 with the names of the farms on which the students live, construct a table showing the extent of pasture land in your community.

6. Using rotations and yields common to your locality, check the accuracy of the statement on page 4 that 1¾ tons of roughage are produced for every ton of grain harvested.

7. Calculate the cash value of this grain and roughage, using prevailing local prices.

8. Obtain crop yields for the current year from a number of grain and livestock farmers in your community; also the amount spent for fertilizers on each farm. Determine the cause of such discrepancies as appear in these data.

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CHAPTER II

ESTABLISHING AND ORGANIZING A DAIRY-CATTLE ENTERPRISE

DAIRY farming as a special branch of agriculture has much to commend it. The income is regular and steady throughout the year, thus furnishing ready cash for operating expenses. The total income from the farm is greater than when crops alone are sold. A considerable part of the farm is employed for the growing of hay and pasture crops, thus reducing the danger of soil erosion with its accompanying loss of soil fertility. The practice of feeding crops and returning the manure to the fields also conserves fertility as compared with selling these crops. Under good systems of dairy farming, the fertility of the soil is actually increased. The dairy cow is an efficient consumer of roughage, converting not only marketable roughage, but also much unmarketable roughage, into readily salable cash products. Much of the pasture of the United States is produced on untillable land which would bring little or no return were it not grazed by livestock. As in the case of other farm animals, the keeping of dairy cows adds much interest to farm life, making it a happy and profitable occupation, and acting as an incentive to young men to remain on the farm.

Management Problems:

1. Determining the adaptability of the locality.
2. Determining the adaptability of the farm.
3. Securing the necessary experience.
4. Securing necessary capital.
5. Choosing the breed.

6. Selecting and buying foundation stock.
7. Preparing a plan of management.
8. Keeping and evaluating financial records.

1. Determining the Adaptability of the Locality.—Choose a locality for a dairy farm which offers a ready market for dairy products. Although roads and transportation facilities are being improved constantly, a locality far removed from a central market would not be best for a dairy farm. The cost of transportation to a far-away market might take away all the profits.

Select a locality which has sufficient rainfall or irrigation facilities and where the soil is sufficiently fertile to grow good feed and pasture crops. Dairy farming is seldom profitable in semi-arid sections where extremely large areas must be cultivated or pastured in order to provide sufficient feed.

Avoid a locality in which land is exceptionally high in price, such as an area bordering a large city. Unless the land is increasing in price and a good profit can be realized from its sale at a later time, the high investment and taxes usually make such a locality impractical for dairy farming.

In general, it is best to select a locality where there are good dairy farms already established, because this usually indicates that the region is suitable for dairying, and, further, offers opportunities for securing experienced labor and for sharing in the many advantages of community effort.

2. Determining the Adaptability of the Farm.—In choosing a dairy farm, select one of sufficient size to permit the return of a large income. Very small farms cannot grow sufficient feed and the investment per acre is too high. As a rule, choose a farm not less than 40 acres in size. About 640 acres may be considered the maximum size to be operated as a dairy farm from one set of buildings when the pasture land is included in a crop rotation system. With a greater acreage than this, cows must walk too far to pasture and too much time is spent in bringing in the crops to the barns and silos, and in hauling manure to the fields.

See that the farm you select has buildings suitable for housing

dairy cattle. An enormous amount of time is wasted in caring for a dairy herd in poorly arranged buildings. Consult the company to which you expect to sell your milk and learn whether the buildings and yards conform to the requirements of the company for the production of clean milk.

Study the farm during the growing season to learn whether it is fertile enough to grow good crops. One beginning to farm can seldom afford to start on a farm which is so depleted of

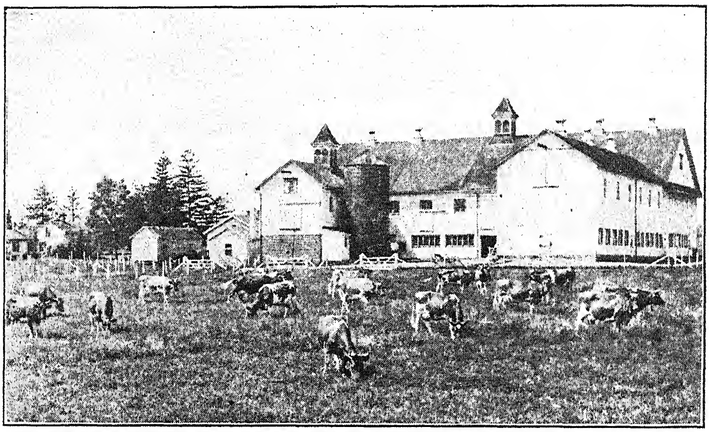

Photo by Allen

FIG. 5.—A SCENE INDICATIVE OF A WELL-PLANNED AND WELL-ORGANIZED DAIRY ENTERPRISE

These Guernsey cows display excellent dairy type. As in the case of the Jerseys, much attention has been given to developing the dairy qualities of the breed to a high degree of efficiency.

fertility that it will require many years of effort to build it up to a profitable level of production. Observe the crops growing on the farm during the summer and also secure the cooperation of your high school teacher or farm bureau adviser in making tests for soil acidity and available phosphorus. Study also the drainage conditions, outcropping of rock, and whether or not the farm is badly infested with noxious weeds, such as quack grass and Canada thistles.

3. Securing the Necessary Experience.—Many men who begin operating dairy farms for themselves are those who have been brought up on dairy farms and have gained the necessary experience in that way. A person who lacks experience in the care and handling of dairy cattle and their products will find it very necessary to secure such experience before undertaking the management of a dairy cattle enterprise for himself.

Securing employment as a tester in a herd improvement association is an excellent way of obtaining experience and also some capital. The same ends are accomplished by working on a well-managed dairy farm. With increasing experience, seek positions as assistant herdsman or herdsman in charge of a large purebred herd.

4. Securing Necessary Capital.—It is not always necessary to have sufficient capital to purchase cows, horses, and machinery for the operation of a farm, although this is desirable. Occasionally a beginning may be made without capital on the basis of a salary and a share of the milk checks on a farm which is already stocked and in operation. In most cases, however, some capital is needed.

Employment on farms or as a tester for a herd improvement association, as suggested in Section 3, are possible ways of securing capital. In some sections, banks and chambers of commerce provide loan funds for the purchase of dairy cattle, taking mortgages on the cattle as security. It is seldom, however, that one can borrow all the capital required. Unless one can begin dairy farming on his father's farm, or on a salary-and-share basis, it is best for one without funds to remain in the employment of others until he has accumulated half or more of the money needed.

5. Choosing the Breed.—Selection of the proper breed for the conditions found in a particular locality may be of much importance, but success in a dairy enterprise is much more dependent upon the initiative, enterprise, and skill of the manager than upon the choice of any one breed. It is best for one about to engage in dairy farming to choose cows of some one

of the dairy breeds, rather than to purchase a miscellaneous collection of low grades or scrubs which represent mixtures of several breeds. It is not necessary to start with purebred females, but they should be high grades at least. There is a far greater difference between the returns secured from good and poor cows of the same breed than between the returns from cows of equal productivity of different breeds. The chief

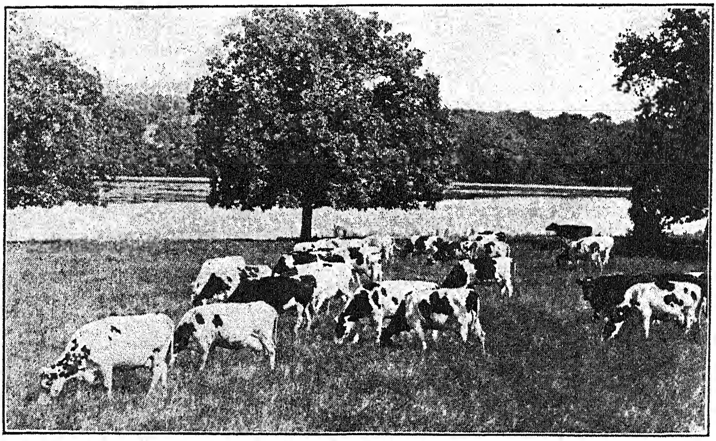

Photo by Allen

FIG. 6.—HIGH-PRODUCING HOLSTEIN COWS AT PASTURE

For many years most of the milk produced for city markets came from Holstein cows, but demands for milk richer in butterfat have led to the supplying of these markets with the milk of other breeds as well.

object in purchasing dairy cattle is to secure a herd of high productive capacity, although there are certain conditions which make the choice of a breed important.

Considerations:

(*a*) Determining the requirements of the market.
(*b*) Determining the breeds most common in the community.
(*c*) Giving consideration to personal preference.
(*d*) Comparing beef value, breeding qualities, etc., of breeds.

(*a*) *Determining the Requirements of the Market.*—The form in which dairy products are to be sold is, in many cases, the most important factor governing the choice of a breed. Investigate the dairy markets in your community and find which offers the best year-round market for milk.

If the sale of whole milk is a possibility, consider the cost of hauling from your farm and whether or not your buildings fulfill the sanitary requirements of the city to be supplied. Under favorable conditions, the sale of whole milk is usually more profitable than the sale of cream or butter. When milk is sold to a creamery or cheese factory and skim milk or whey is returned to the patron for feeding, the value of these feeds should be computed as part of the returns received for milk. The same rule applies if cream is separated on the farm and the skim milk fed. Place a value on 100 pounds of skim milk of one-half the price of a bushel of corn, and one-half as much for whey as for skim milk.

In acquainting yourself with the market requirements for milk, learn the minimum percentage of fat allowed in the milk, as this has an important bearing in choosing a breed. The Holstein, Ayrshire, and Brown Swiss breeds are the most economical producers of whole milk on the hundred-weight basis, and ordinarily one of these breeds should be selected to supply a whole-milk market. If, however, the minimum percentage of fat allowed is 3.8 to 4.0 per cent, then the Holstein breed is at a serious disadvantage. One may, of course, maintain a herd consisting partly of Holsteins and partly of Jerseys or Guernseys, but this is objectionable on farms where but one herd sire is kept and calves are raised. In a few years the herd will consist of low grades or scrubs.

The Jersey and Guernsey breeds are the most economical for the production of butterfat. When cream is sold on the butterfat basis and the value of skim milk is not high, one of these breeds should be chosen. Any of the other breeds may be profitable for cream production, however, where good returns are received for the skim milk throughout the year.

TABLE 4

CHARACTERISTICS OF THE DAIRY CATTLE BREEDS

	Holstein	Jersey	Guernsey	Ayrshire	Brown Swiss
	Dairy Characteristics				
Average annual milk production, pounds	9,500	6,000	6,500	7,000	7,250
Percentage butterfat	3.45	5.35	4.9	4.0	4.0
Size of fat globules	Very small	Large	Very large	Medium	Medium
Color of milk	Very white	Yellow	Very yellow	Medium	Medium
	Breed Characteristics				
Average weight of mature males, pounds	1,800–2,200	1,400–1,700	1,600–1,800	1,600–1,800	1,800–2,000
Average weight of mature females, pounds	1,250	900–1,100	1,100	1,100	1,200
Average weight of calves at birth, pounds	90	55	65	70	100
Color of hair	Black and white	Light fawn to almost black (solid or broken)	Yellow orange to reddish fawn with white (solid or broken)	Red to dark mahogany and white	Light mouse to dark seal or black. Mealy ring on back and around muzzle
Disposition	Gentle	Active but gentle	Gentle	Very active	Very gentle

Special markets are sometimes available. Holstein milk produced under especially careful conditions to be used for infant feeding brings a good price on the city market. Hotels, restaurants, and railroad dining car service pay premiums for special grades of milk, such as Jersey or Guernsey milk, and for special grades of sweet cream. High-quality "country"

butter commands a premium in many of the smaller towns and cities. As a rule, however, the beginner must depend upon the general market. It is only after he has learned how to produce a high-grade product and to keep the quality high and constant

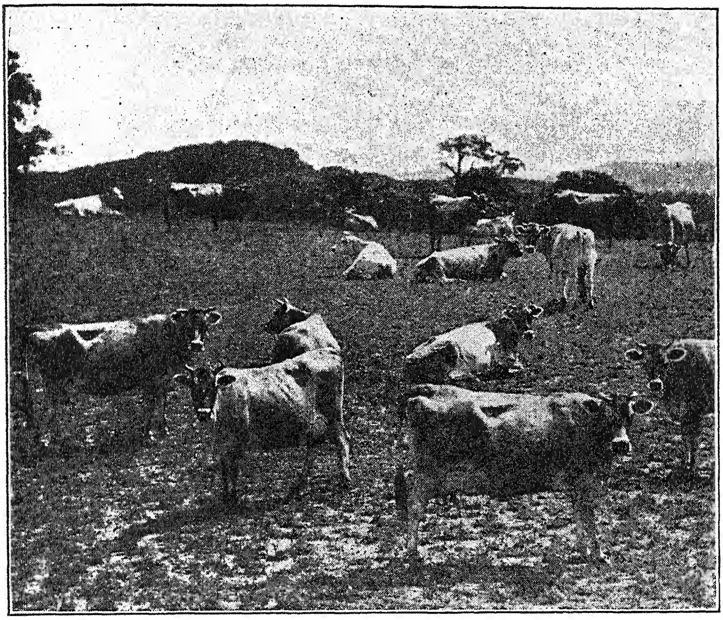

Photo by Allen

FIG. 7.—THE JERSEY IS NOTED FOR BOTH UTILITY AND BEAUTY

The extreme dairy type is best exemplified in the Jersey breed. Beauty and refinement have been secured without sacrifice of excellent butterfat-producing qualities. It is evident that the cows shown in this picture were well supplied with feed in addition to that derived from the pasture.

throughout the year that he can expect to take full advantage of these special markets.

(*b*) *Studying the Advantages of the Breed Most Common in the Community.*—Many advantages are to be had through community cooperation in the purchase and exchange of sires, advertising, public sales, marketing of products, and other ways.

Visit some of the leading breeders in the locality and secure their opinions upon the advantages to be derived from selecting the breed most common in that section as compared with selecting another much less common. If you know of no dairy cattle breeders in your locality, secure a list from the farm bureau or write one of the dairy cattle breed associations listed in the references at the end of this chapter.

(c) *Giving Consideration to Personal Preference.*—One is more likely to be successful with a breed for which he has a strong personal preference than with some other breed. Other factors being equal—that is, if the kind of market and community preference have no great weight in your case—select the breed for which you have a strong liking.

(d) *Comparing Beef Value, Breeding Qualities, etc.*—The beef value of a dairy cow is a small item compared with the value of the milk produced during her lifetime. Each year the total value of the milk of a good dairy cow may be from one to three or four times as much as her beef value. Milk-producing ability is by far the most important factor in the selection of dairy cows.

It is claimed that one breed may excel another in breeding qualities and freedom from disease. It is likely, however, that there are no essential differences between the dairy breeds in these respects. All the dairy breeds have been improved to such an extent that the purebred animals transmit breed type and characteristics with great certainty. All the breeds are subject to attack by diseases such as infectious abortion.

There is little difference between the dairy breeds in their ability to use roughage and in their grazing ability. The Jerseys seem to withstand hot weather somewhat better than the other breeds and may be best suited, therefore, for the southern states.

6. Selecting and Buying Foundation Stock.—One may purchase young heifers more cheaply, as a rule, than mature cows, but one starting to operate a dairy farm cannot afford to wait from one to two years for returns from his herd. Some of

the cows purchased, therefore, should be of milking age so that returns will be received at once or during the first year.

Choose animals of good type so far as possible. Keep in mind the fact that dairy farming is a long-time business venture and that the type of the foundation animals will affect the type of animals in the herd for years to come. It is more important to secure good type if a purebred herd is being established than

Photo by Hildebrand

FIG. 8.—KNEE-DEEP IN LUXURIANT PASTURE

The Ayrshire with its upward-curving horns and smooth, symmetrical body is perhaps the most picturesque dairy breed. The cows are also noted for their shapely udders and straight top lines. This scene shows Ayrshire cows of superior type and development.

in the case of a grade herd, but even grade cows of good type are, as a rule, better producers than those of poor type.

Good individuality is usually associated with good productive capacity, but this is not true in all cases. Some cows produce large amounts of milk for a few months but are dry 3 or 4 months in the year. Others fail to yield as much as would be expected for cows of their type. For such cows the most reliable guides in purchasing are annual records of production,

such as dairy herd improvement association records, advanced registry records or private records of the owner. If possible, purchase animals from a herd in which production records are kept.

The most dependable guide to the productive capacity of an animal aside from the production records of the animal itself is an ancestry in which all animals for several generations have excellent production records. Discount to a great extent production records of ancestry four to six generations removed when there are no records for the parents, grandparents, or great-grandparents.

The herd sire for both grade and purebred herds should be purebred. The most valuable fact which can be learned concerning the probable value of a young bull in transmitting productive ability to his offspring is the productive ability of his full sisters. In case there are no full sisters, then records of half-sisters from the same dam give valuable information. The fact that an animal has a record of good production is not proof that it can transmit qualities of high production to its offspring. This can be demonstrated only in the performance of the offspring. Young bulls selected merely upon individuality and the production records of their dams, therefore, are sometimes disappointing.

The most certain method of insuring the progress of the herd in productivity is to secure an aged sire of proven merit. It is particularly advantageous in founding a dairy herd to secure a sire which has daughters which have been found not only to be good milkers, but to have records of production exceeding those of their dams. Vigorous sires of this sort which may be secured at reasonable prices are few. Their use, however, is the most reliable method of improving the productivity of the herd, and one can afford to pay several times as much for a sire of this sort as for the best cow in the herd. Before purchasing an aged sire, be sure that he is in good breeding condition and free from disease.

Much care must be taken to guard against the purchase of

diseased animals. Most states require tests for abortion and tuberculosis when cattle are shipped from one state to another. Cattle which are to be merely additions to a producing dairy herd are best bought as unbred heifers past the milk-feeding age, for there is less likelihood that they will carry abortion germs at that age.

Inspect the animals carefully for signs of other illness or ailments, such as lameness, swollen joints, and blindness.

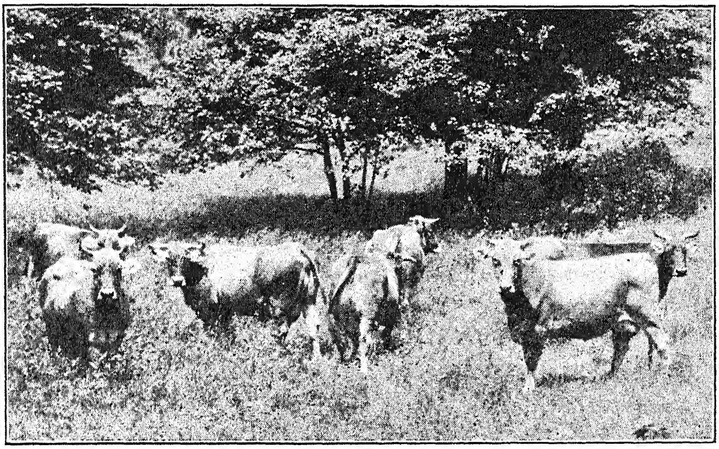

Photo by Live Stock Photo Co.

FIG. 9.—BROWN SWISS COWS AT PASTURE

This hardy Alpine breed is finding favor in the United States. The milk-producing ability of the cows, their docility, large size, and ruggedness make them desirable on general dairy farms.

When purchasing a number of high-priced animals, employ a veterinarian to inspect them.

7. Preparing a Plan of Management.—A well-thought-out plan of management is one of the essential features of a successful dairy enterprise. Too often a man taking over a dairy enterprise on a farm having a fertile soil, good buildings, and a good herd fails in business, while another man with no better facilities at the start makes a success.

Considerations:

(*a*) Keeping investment low.
(*b*) Keeping operating expenses low.
(*c*) Adjusting livestock and crops to amount of labor available.

(*a*) *Keeping Investment Low.*—Success in any business enterprise is measured largely by the returns on the investment. It is very necessary, therefore, that the investment in land, buildings, livestock, and equipment be kept as low as is consistent with carrying forward the enterprise in an efficient manner.

As pointed out in discussing the adaptability of the locality (page 19), very high-priced land may not be profitable. Pride in appearances and the desire to enjoy the most modern conveniences often are responsible for buildings and equipment which are too elaborate and expensive for their purpose. High-quality milk can be produced and cattle kept comfortable in buildings of moderate cost without the use of high-priced equipment. Every dollar saved from needless investment increases the earning power and security of the enterprise. This does not mean, however, that buildings should not be kept in good repair and well painted. Neatness and orderliness on the farm increase the pleasure and satisfaction derived, a part of the returns which should be expected from any successful enterprise.

(*b*) *Keeping Operating Expenses Low.*—The principles just outlined with respect to investment apply also to operating expenses. Farm-management studies show that economy in operation is one of the main factors in determining net income.

Watch all items of expenditure. Compute the relative economy of different feeds before purchasing, as described in Chapter VII. Secure equipment of the right size and amount. It is a waste of money to keep eight horses if six will do the work, or to have a 2½-ton delivery truck if a 1-ton truck will do equally well. Then, too, some jobs such as testing seed corn, whitewashing barn interiors, and painting buildings may be done by farm help in spare time instead of hiring the work done

by outsiders. These are but a few of the many instances where money may be saved.

(c) *Adjusting Livestock and Crops to Amount of Labor Available.*—It was pointed out in Chapter I that one of the objects of a livestock enterprise is to furnish a market for labor of the farm family, employees, and horses. Too often the number of dairy cattle kept is out of proportion to the labor, land, or crops available.

A man who is engaged in general farm work can milk from 7 to 10 cows twice daily by hand, or 20 to 30 with a milking machine. Thus on a 160 acre to 200 acre corn-belt farm, two men can operate the farm and care for a herd of 15 to 20 cows if hand milking is done or up to 30 or more cows if milking machines are used. Keeping 40 to 50 cows on such a farm would require extra help with the milking and care of the herd, but the farm work would not be sufficient to justify the employment of another man for full time, particularly during the winter. Then, too, a herd of 40 to 50 milking cows, together with young stock, might require too large an area of pasture and meadow, leaving too little tillable land for the production of corn silage and other feed crops. If a herd of 20 to 30 cows is not sufficient to give full-time employment to two men on this farm, then hogs or other livestock might well be combined with dairy cattle. Such a plan not only utilizes labor and crops more efficiently, but helps to insure a regular income in times of fluctuations in supply and demand, as discussed in Chapter I.

Make careful calculations of the amounts of crops which the farm will produce and the amounts required by the livestock. A dairy cow requires about 1½ tons of hay, 3 to 4 tons of silage, and 1 to 3 acres of pasture yearly. In terms of acres, this means about 1 acre for hay, ⅓ to ½ acre for silage corn, and 1½ acres of pasture, or approximately 3 acres for the growing of the roughage. In grade herds where the only stock raised are the best heifers, from one-fifth to one-fourth as much land is needed for the young stock and herd sire as for the cows. In purebred herds where bull calves are raised to one year of

age or more, young stock and herd sire require from one-third to one-half as much land as the cows.

An important item to consider in this connection is bedding. The yearly bedding requirement in terms of straw, corn stover, or shavings is 1 to 2 tons for each animal in the herd. It is pointed out in Chapter VII that oats yield but small returns to the acre in feeding value. The straw, however, fulfills a valuable function as bedding. Even though oats or wheat are not profitable as grain crops, it is possible that their use in the rotation as nurse crops for clovers and alfalfa and as a source of straw for bedding may justify their being grown.

Because of the wide variations in the productivity of land in different sections, no hard and fast rules can be laid down for apportioning land for the different crops and for determining the number of cattle to be kept. Rather than start with too large a number of cattle, it is best to begin with a moderate-sized herd which can be well cared for by the help available. As facilities permit, additions to the herd may be made by raising heifer calves from the best cows.

8. Keeping and Evaluating Financial Records.—It was pointed out in Chapter I that detailed written records are essential in any livestock enterprise large enough to justify the farmer's attention. Records are more necessary perhaps in the dairy enterprise than with other classes of livestock, for without records several cows which were entirely unsuspected by the owner as being especially poor might take away much or all of the profits made by the other cows in the herd. In a herd of grade dairy cattle the most necessary records are those of the milk production of each cow, cost of feed, and service dates. In purebred herds complete breeding records are of first importance.

Records of milk yield are best made at each milking so that they not only provide a true record of production, but also furnish an accurate guide for feeding, possible illness of the cows, and efficiency of the milkers, and add interest as well to the enterprise. It is best to test the milk of each cow for butter-

fat also. Records of production and feed cost may be obtained through membership in a herd improvement association, although such records are not always so good a guide to the feeding of the cows. The association records, however, have advertising and sales value for the herd, and membership in such an association leads to community effort in public sales, purchase and use of sires, feed purchases, etc.

Records of production are of greatest value in improving the quality of the herd, for they make it possible to single out and dispose of the poorest animals and to select the highest producing cows from which the heifers should be raised and retained in the herd.

Consult the references at the end of this chapter for directions for keeping records of the dairy herd.

FARM STUDY

Study the conditions on your home farm and farms visited which determine the keeping of dairy cattle, the organization of the enterprise, etc. Use the following questions as a guide:

1. Is the locality in which the farm is situated suitable from the standpoints of:

   (*a*) Nearness to market?
   (*b*) Value of the land?
   (*c*) Ability to grow crops?
   (*d*) Nearness to other dairy farms?

2. Is the farm suitable for operation as a dairy farm considering:

   (*a*) Size sufficient to yield a good income?
   (*b*) Size not too great?
   (*c*) Buildings suitable for the purpose?
   (*d*) Ability to grow crops?

3. Did the owner or operator secure his experience as a dairy farmer before beginning farming for himself? How was this done?

4. How was the capital for beginning the business secured?

5. What were the factors which caused the owner or operator to choose the particular breed of cattle kept?

6. To what kind of a market is the milk or cream sent?

7. What are the requirements of the market with regard to butterfat percentage, conditions of the barn in which milk is produced, etc.?

8. Were the foundation animals in the herd secured at public sales, by private sale, or by taking over a herd already on the farm?

9. Are female animals purchased as additions to the herd? If so, at what age are they purchased? What precautions are taken to prevent introduction of disease? Are records of production considered in making the purchases?

10. How is the herd sire selected? Is he secured as a young or as a mature animal?

11. How many cows of milking age are there in the herd?

12. How many of the young animals are raised each year?

13. How many acres are there in the farm? How many acres in:

(*a*) Pasture?
(*b*) Meadow?
(*c*) Silage corn?
(*d*) Grain crops for feeding?
(*e*) Grain crops for sale?
(*f*) Other crops?

14. How much labor, (*a*) hired (*b*) operator (*c*) family, is used in operating the farm?

15. Are records kept of:

(*a*) Milk yields of each cow?
(*b*) Percentage of fat in milk of each cow?
(*c*) Feed costs for each cow?
(*d*) Breeding?
(*e*) Other farm activities?

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Note: See also the references in Chapter I.

CHAPTER III

ESTABLISHING AND ORGANIZING A BEEF-CATTLE ENTERPRISE

Beef production as a major farm enterprise is more or less limited to those sections of the country which have large supplies of feed in the form of either pasture or harvested grain and hay. However, a considerable amount of our beef supply comes from outside our principal beef-producing areas, having its origin on general farms where cattle raising and feeding are regarded as side lines of other farm enterprises. Whether handled as a main project or as a side line, beef cattle aid materially in increasing farm profits by utilizing unmarketable feeds and pasture and employing otherwise idle labor, as well as by conserving the fertility of the soil through feeding on the home farm rather than selling the crops grown.

Management Problems:

1. Determining the adaptability of the locality.
2. Determining the adaptability of the farm.
3. Deciding on the kind of beef-cattle enterprise.
4. Preparing a plan of management.
5. Deciding on the size of the herd.
6. Choosing the breed.
7. Selecting and buying animals.

1. Determining the Adaptability of the Locality.—For many years the mistaken notion has been abroad that beef cattle are likely to prove profitable only when raised and managed according to the methods used in extensive production. While it is true that beef cattle are well adapted to the large ranges of the West, it by no means follows that they may not

also be profitable when kept on the smaller, more intensively cultivated farms of the central and eastern states. Obviously the methods of production followed will vary widely in different parts of the country to suit local conditions, but there is little occasion for any individual farmer to abstain from beef production on the ground that this enterprise is unsuited to his particular locality.

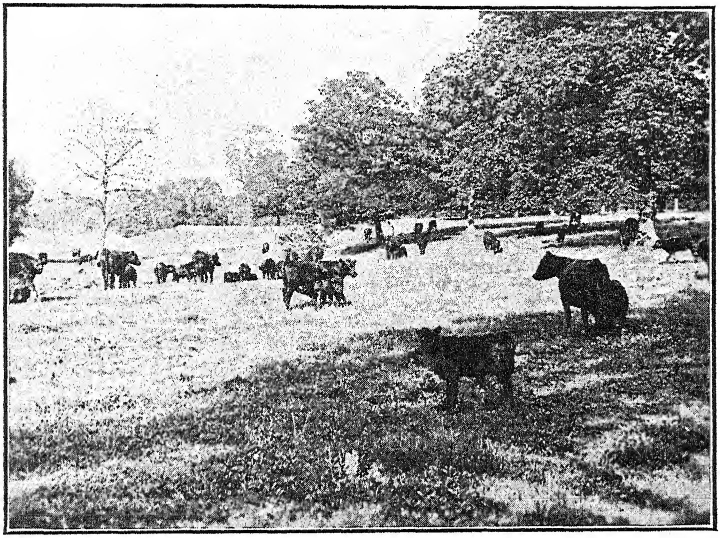
2. Determining the Adaptability of the Farm.—The character and quantity of feed crops produced are the chief factors which determine the adaptability of a given farm for beef production. Unless a sufficient amount of suitable feed will be available each year to maintain at least a small breeding herd or to fatten a small drove of steers, one is not justified in starting a beef-cattle enterprise. Beef cattle are especially well adapted to utilize pasture and coarse roughages. Hence, on farms where such feeds are produced in abundance, a suitable beef-cattle enterprise rightly handled usually will add materially to the farm income.

Owing to the fact that a moderate-sized or even a large drove of cattle can be cared for with but little more labor than is needed for a few head, the return per unit of labor expended in caring for beef cattle falls rapidly as the size of the herd is decreased. Hence beef cattle cannot be recommended for the small farmer who is seeking a way to put to profitable use labor which is inadequately employed. On the other hand, the labor requirements of the farm frequently may be cut more than 50 per cent simply by replacing dairy cattle with beef cattle.

Except in the southern states beef cattle need some shelter during the winter months. Also, there must be storage for hay and other feeds for winter use. Farms which are already provided with barns, sheds, silos, and fenced pastures and lots are particularly well adapted for the handling of beef cattle, although the sheds and other equipment necessary in starting a beef-cattle project may be built without great expense.

3. Deciding on the Kind of Beef-cattle Enterprise.—Beef-cattle enterprises may be classed as breeding or feeding enter-

prises, depending upon whether a breeding herd is maintained for the production of calves or thin cattle purchased to be fattened for market. Breeding enterprises in turn may be divided into grade and purebred herds and each of these still further subdivided into herds of strictly beef and dual-purpose type. Likewise feeding enterprises may be divided into those which grow out or develop young animals on grass and other



Courtesy of N. E. Franklin

FIG. 10.—A COW AND CALF ENTERPRISE

This enterprise usually is well suited to farms having a considerable area of permanent pasture.

roughages and those which, through the liberal use of concentrates, prepare the steers for market as quickly as possible.

While in some sections of the country the common plan is to specialize on a single phase of beef production, as for example the breeding of calves in the Southwest and the fattening of steers in the corn belt, it frequently happens that two or more phases are carried on at the same time on the same

ranch or farm. Especially is this true in the production of "baby-beeves," where the fattening of the calves is begun while they are still nursing their mothers. Here the breeding, development, and fattening processes form one continuous operation.

The particular phase of beef production to be undertaken should, of course, depend upon the type of farming practiced, the available capital and labor, and the experience and preference of the operator. Breeding enterprises are especially well adapted to farms which have an abundance of pasture and roughage, while feeding projects are well suited to level, fertile farms which produce much grain and other fattening feeds. Dual-purpose cattle are well suited to small and average-sized farms on which cattle are kept to obtain the greatest possible diversification of enterprise and the full utilization of all farm products, including otherwise surplus labor. As a rule purebred cattle should be the goal rather than the immediate interest of the beginner stockman, owing to the relatively large amount of capital required and the skill and sound judgment necessary for the successful breeding, development, and sale of valuable pedigreed animals. They may very properly, however, be the ultimate goal of those stockmen who find their chief interest in beef cattle.

4. Preparing a Plan of Management.—As stated in Chapter I, every livestock enterprise should be undertaken only after a definite plan of management has been worked out. Such a plan is indispensable as a guide in determining the proper size of the herd and as a reminder in the doing of many tasks that otherwise might be forgotten or left undone. Plans for the management of beef cattle will vary, of course, with the nature of the enterprise concerned. However, their formulation will usually involve the following procedure:

Procedure:

(*a*) Estimate the available feed supply.
(*b*) Study the labor situation.
(*c*) Consider the equipment required.

(*d*) Study the market outlook.

(*e*) Formulate a plan of management adapted to the situation.

(*a*) *Estimate the Available Feed Supply.*—The probable feed supply is the first item to be given consideration in preparing a plan of management, as the amounts and kinds of feeds available will determine not only the number of cattle that may be kept safely but also the calendar or schedule according to which they are to be handled. Careful estimates should be made of the amount of grain, roughage, and pasture which will be available during a normal year and the probable dates such feeds will be ready to use. Inasmuch as the chief purpose of establishing the cattle enterprise is to use such feeds efficiently, the plan of management adopted should be one which will achieve this objective.

(*b*) *Study the Labor Situation.*—Similarly, the plan of management should provide for the profitable employment of labor. Care must be taken to guard against an excessive use of labor or the use of labor already required in other farm enterprises. The ideal scheme, of course, is one in which the peak labor requirement of the cattle comes at a time of year when labor is not needed elsewhere.

(*c*) *Consider the Equipment Required.*—The equipment needed in the production of beef cattle is neither elaborate nor expensive. On a majority of farms the open sheds, feed racks, and fences in use have been built largely by ordinary farm labor and represent a total investment of but a few dollars per head of cattle handled. Shelter, which ordinarily is thought of as being the major item of equipment, frequently is provided at very low cost by working over an old crib or barn. In the absence of permanent buildings, straw sheds may be used until such time as money is available for the construction of better shelter facilities. A silo and a small paved lot adjoining the shed are highly desirable items of equipment for beef cattle in most sections of the country, but the beginning operator of limited means may find it necessary to postpone their construction until the herd is on a sound, paying basis.

(*d*) *Study the Market Outlook.*—In planning a system of management for a cattle enterprise, attention should be given to the probable market situation in order that the prices received for the animals sold may be as favorable as possible. Such a study will include the usual seasonal fluctuations in prices for the various classes and grades of cattle as well as the preference of the consuming public for quality and small-size cuts of beef. While it is impossible, of course, to forecast the future cattle market with any high degree of accuracy, one can at least strive to produce the kind of cattle for which there is a broad demand and to have them ready for market at the time of year when such animals normally sell at good prices.

(*e*) *Formulate a Plan of Management Adapted to the Situation.*—There now remains the important step of formulating such a plan of management as will utilize to the best advantage the existing facilities for the phase of beef production that is to be undertaken. Obviously, the plan will be modified as the years go by and additional feed, improved buildings, and better animals become available. Consequently, major attention should be centered on a proper balancing of the needs and resources of the first three or four years rather than those of a longer, more uncertain period.

5. Deciding on the Size of the Herd.—Eventually the size of the herd probably will be determined largely by the prospective feed supply. However, in the beginning either available capital to buy the foundation animals or labor or equipment to care properly for them may be the limiting factor. In any case no more animals should be bought than can be cared for without danger of overburdening the men with chores, overtaxing equipment facilities, or exhausting feed supplies before the next crop of feed is available or the cattle are ready for market. A herd somewhat smaller than the number of animals which later developments prove might have been carried is always more satisfactory and profitable than one which proves to be too large to be cared for properly. For the beginner 3 or 4 bred heifers or cows with young calves are enough with which to

start a breeding project, while 6 to 10 steers are sufficient to begin a feeding venture. However, satisfactory profits are not likely to be realized from beef herds numbering much less than a dozen cows or 15 to 20 fattening animals. Hence, for the average farmer herds of at least this size should be the ultimate goal if possible.

6. Choosing the Breed.—Three beef and two dual-purpose breeds of cattle are distributed widely throughout the United States. In addition two minor breeds, the Galloway and the Devon, have some importance in certain small sections of the country. While it is true that the best show-yard specimens of all three beef breeds are very similar in general type and other essential qualities, certain important and rather well recognized differences are to be found in the cattle under actual farm or ranch conditions. These differences as well as the personal likes or preference of the breeder should be taken into account in the establishment of a herd.

Only a brief description of the important beef and dual-purpose breeds of cattle will be herein attempted. For a more lengthy account the reader is referred to the many excellent books and pamphlets dealing with this particular subject.

The Shorthorn.—The Shorthorn breed of cattle was developed in the northeastern part of England, beginning about 1880. At present they are to be found in nearly all the important beef-producing countries of the world, being the leading breed of the British Isles, Argentina, Canada, New Zealand, and the United States. Their popularity is due largely to their rapid growth resulting in good size for age, their quiet temperament, and their unusually good milking qualities. While still exceedingly popular with general corn-belt farmers, they have in late years lost favor with the highly specialized steer feeder because they are lacking in pronounced blockiness and early maturity, and have a tendency to become somewhat rough and unevenly fleshed when fed until highly finished. Undoubtedly, some of the objection to Shorthorns for the feed lot is due to their variable colors. Not only do steers with different

markings suggest a lack of uniformity in general appearance, but the light-colored animals show dirt and stains easily.

Shorthorn cattle because of their size and feeding habits are best suited to areas which have ample feed supplies, such as are found in the corn belt and in the more productive areas of the range states. Hence a large percentage of Shorthorn steers are grown and fattened on the farms or ranches where they are born. Nevertheless a considerable number of cattle

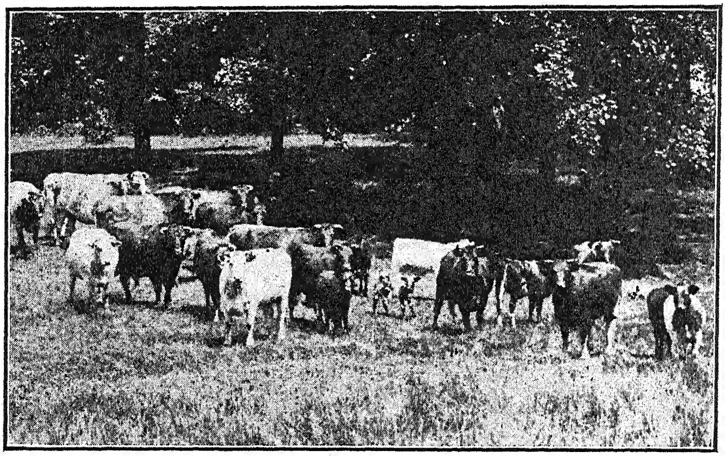


FIG. 11.—A HERD OF PUREBRED SHORTHORN CATTLE

of this breed are marketed in feeder condition, especially from the northern range states, where Shorthorns are more numerous than farther south. Also, many odd-sized lots of native Shorthorn steers which show little or no evidence of grain feeding are received in cooperative shipments at the central markets. Such steers when sorted into uniform lots by yard dealers usually make very satisfactory feeders, particularly for a short feed.[1]

Despite the official name of the breed, not all Shorthorn

[1] Cf. Fig. 15.

cattle possess horns. Although the number of polled animals is relatively small, they are to be found in practically every state of the Union. Only in the possession of the polled character do they differ from horned cattle of this breed.

The Hereford.—Hereford cattle were developed in western England, beginning about 1800. Although a close second to Shorthorns from the point of numbers, they differ from them in being less widely distributed. However, in those countries, states, and localities where they are popular they are often the predominant breed. Their attractive and uniform color

Courtesy of University of Illinois

FIG. 12.—A HERD OF PUREBRED HEREFORD CATTLE

markings make them exceedingly interesting to the observing public.

Hereford cattle are noted for their strong constitution and general thrift and ruggedness. Hence they have long been favorites in the range area of the United States as well as in other countries where cattle raising frequently is handicapped by adverse feed and weather conditions. They are particularly good grazing animals and will, if necessary, cover much territory in search of feed and shelter.

By their adherence to a strictly beef type of animal, Hereford breeders have succeeded in producing steers which are exceedingly popular with corn-belt feeders as well as with market buyers and butchers. However, in doing so they have

neglected to maintain milking ability in the cows, which fact is largely responsible for the secondary position held by Hereford breeding herds in the corn-belt states.

Owing to the fact that Hereford cattle occupy such a large part of the range area, large numbers of Hereford steers are available for feeding purposes, especially in the fall and early winter. Probably considerably over 50 per cent of the shipments of stocker and feeder cattle from the large livestock markets show a predominance of Hereford breeding, to say

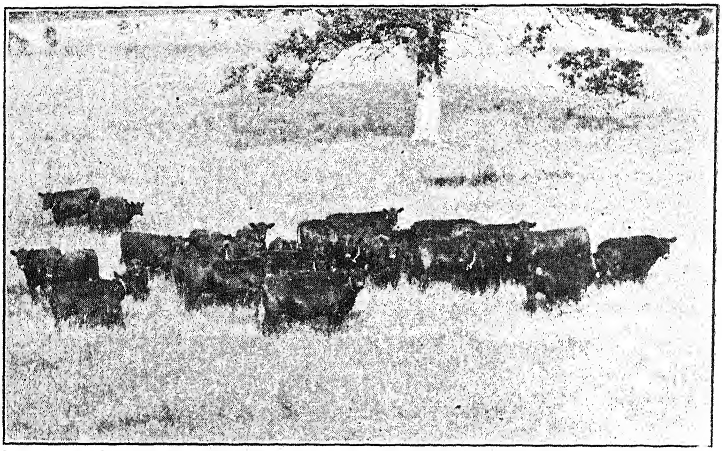


Photo by Hildebrand *Courtesy of Briarcliffe Farms*

FIG. 13.—A HERD OF PUREBRED ABERDEEN ANGUS CATTLE

nothing of the large numbers of Hereford calves and yearlings shipped directly to the corn belt from the range.

A small percentage of Hereford cattle are naturally polled. Some breeders have specialized on the polled variety and have developed the so-called "Polled Hereford." Such cattle are purebred Herefords in every respect; in fact polled cattle are shown in the same classes with horned Herefords at shows and fairs.

The Aberdeen Angus.—The native home of Aberdeen Angus cattle is in northeastern Scotland. Introduced into the United

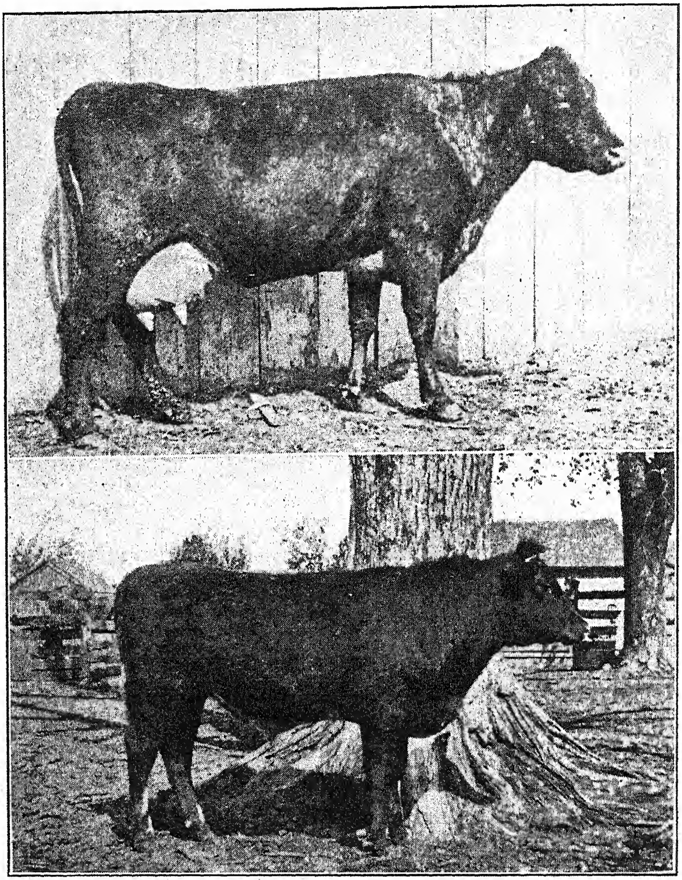
States long after the other breeds were firmly established, they have not as yet reached the wide distribution or the numerical importance attained by the Shorthorn and Hereford breeds. Nevertheless they have achieved much popularity by their repeated winnings in the interbreed fat-steer contests at the large livestock shows, particularly at the International Livestock Exposition, at Chicago. Here the Angus have won 17 single-steer championships, 25 carload-lot championships, and 28 carcass championships at the 30 shows held up to and including the year 1931. Such a record is unmistakable evidence of the superior quality possessed by the finished Aberdeen Angus bullock. Not only is it noted for its smooth, even flesh, but also for its excellent distribution of fat within the lean tissues. This condition is known as "marbling" and is an essential characteristic of high-quality beef.

While the finished Angus steer is generally conceded to be nearly the ideal butcher's beast, some complaint is made by producers that Angus cattle lack sufficient size and weight to make them highly profitable. Also it is claimed that they are rather nervous and excitable and tend to become wild and unmanageable when turned out on pasture. However, the men most familiar with the breed maintain that the average Angus is of proper size to meet present-day market demand for lightweight beef and that the temperament gives little trouble where the cattle are carefully handled.

Angus steers are not available for feeding purposes in such numbers as are Shorthorns and Herefords. Produced as the majority are on corn-belt farms, they are usually fattened by their breeders and marketed as "baby beeves" when from 12 to 15 months of age. Angus breeders who do sell their calves at weaning time often contract the pick of their calves early in the summer, at prices materially above prevailing market quotations, to men who feed steers for show purposes.

The Red Polled.—The Red Polled is a dual-purpose breed which originated in the east-central part of England and was first imported to the United States in considerable numbers

during the period 1880–1890. Its color is a deep red, excepting the white switch of the tail. Some variation is noted in the



Courtesy of George Horn

FIG. 14.—A GRADE SHORTHORN COW OF DUAL-PURPOSE TYPE AND HER 10-MONTHS-OLD CALF

form of body, some individuals inclining toward the beef type and others toward the dairy type. This fact should be kept

in mind in choosing animals of this breed, in order that those selected may conform closely to the type which the prospective breeder hopes to produce; otherwise considerable variation of type will appear in the calves, necessitating a heavy culling to maintain a uniform herd.

Red Polled cattle are confined principally to the corn-belt states, where their dual-purpose function makes them well suited to diversified farming. Even here, however, they constitute only about 3 per cent of the total cattle population. Red Polled steers usually are fattened on the farms where they are produced. Hence few thin steers of this breed are available for feeding purposes.

The Milking Shorthorn.—Early in the development of the Shorthorn breed certain breeders laid great emphasis upon the milking qualities of their cattle. Thus it has come about that two strains of Shorthorns have been developed, one of distinctly beef type and the other of dairy or dual-purpose conformation. While an occasional crossing of the two types is made to improve milking and fleshing qualities in the beef and dairy types respectively, the blood lines of the two strains are essentially distinct. However, both types are recorded in the same herd books and are promoted by the same breed association.

Milking Shorthorns, like Red Polled cattle, show considerable variation in type, some having such a preponderance of beef or dairy characteristics as almost to preclude their being classed as dual-purpose animals. However, herds which have been carefully bred with the dual function in mind contain numerous individuals of the true "double-decker," or "general-farm-cow," type. Such cows easily yield from 5000 to 7000 pounds of milk a year and produce calves which make very acceptable steers for the feed lot, particularly if these steers are so fed as to be marketed at from 15 to 18 months of age.

7. Selecting and Buying Animals.—The proper method of selecting the animals for a beef-cattle enterprise will depend upon whether a breeding or a feeding venture is to be attempted.

Since they differ widely in many important respects they will be discussed separately.

Considerations:

(*a*) Selecting animals for a breeding herd.
(*b*) Buying stockers and feeders.

(*a*) *Selecting Animals for a Breeding Herd.*—At the outset it may be said that the principles stated in Chapter I relative to the purchase of foundation stock apply fully to beef cattle.[2] The beginning breeder will usually find it best to start with a grade herd, as it will require less capital and skill in its selection and management than a purebred herd. Because grade cows and heifers frequently are purchased in lots of 10 to 50 head or more it often happens that too little time is spent in examining the individual animals to insure the rejection of those which give little promise of being profitable producers. Only in respect to pedigree and breeding record, about which there is relatively little information in the case of grades, should the selection of grade and purebred animals show any appreciable differences.

Individuality.—In selecting for " individuality " one should strive to secure cows and heifers that are deep and low-set and which show evidence of early maturity. Width and smoothness are largely a matter of condition. However, ample spring of rib, good width of rump, and general straightness of lines should be present even in a thin animal. Avoid females which are above average size for the breed, as such animals are likely to be coarse and rough. Also, they require more feed than smaller individuals. Attention should be given to development of udder, as a poor milker is of little value even in a strictly beef herd. In buying purebred cattle one should select animals which have the color and the shape of head and horns which are regarded with favor by the majority of breeders. Particularly should this point be observed in buying bulls, as the

[2] Cf. pages 11–13.

reputation of a herd is determined largely by the general merit of its head sire.

Breeding Record.—A mature cow which has not produced a calf within the preceding year should be regarded with suspicion, particularly if she does not show plainly that she is well along with calf. Breeding records showing occurrence of heat periods, dates of service, time of calving, and disposition of offspring usually are available in a purebred herd and should be examined if possible. Cows and heifers which do not come in heat regularly or which do not become pregnant when bred obviously are "shy breeders."

Pedigree.—In establishing a herd of purebred cattle an effort should be made to secure cattle with popular blood lines; otherwise it will be difficult in future years to make sales at remunerative prices. Beef cattle breeders are prone to place more emphasis upon "families," "strains," and similar subdivisions of a breed than breeders of other classes of livestock, and the beginner will do well to inform himself regarding the meaning and import of the various names and terms which are used in referring to the different strains of his particular breed. Such information is not to be found in books or breed publications; it can be gained satisfactorily only by talking with someone who has had a long experience with purebred cattle.

Age.—Cows from 4 to 7 years of age usually prove the safest investment provided they are proved breeders and are known to be free from disease. Often at public sales such cows can be bought with young calves by their sides and rebred to a good bull for no more than the cost of yearling or two-year-old heifers. When cattle are bought at private treaty, yearling heifers often represent the most value for money invested, particularly if they are in pasture condition.

Young bulls from 14 to 20 months of age are available in greater numbers than older bulls. Occasionally tried sires which are being discarded to avoid too close breeding can be purchased for but little more than their beef value. Such

animals are available particularly in the case of grade herds, where the bulls are changed every 3 or 4 years to prevent inbreeding.

Freedom from Disease.—In purchasing breeding cattle extreme care should be taken to guard against buying animals having tuberculosis or abortion disease. These diseases are highly contagious and if introduced into a herd will soon spread until practically the whole herd is infected. Fortunately, reliable tests are available for use in detecting the presence of these diseases in cattle. Prospective purchases should be made only on the condition of "negative reactions."[3]

Guarantee.—It has become customary for the seller to make certain guarantees in respect to the future usefulness of purebred cattle. However, in order to avoid possible misunderstandings it is well for the two parties concerned to have clearly in mind just what items are to be covered. The form of guarantee endorsed by the American Shorthorn Breeders' Association covers all points about which difficulties are likely to arise, except that up to the present date a sale is conditional on a satisfactory passing of the blood test for contagious abortion only when the animal is to be shipped into a state requiring such blood test for admission. This guarantee may be found in complete form in the catalog of any public sale sponsored by the Shorthorn Breeders' Association or in modified form in the catalog of any important auction sale of registered Shorthorn cattle.

Cost.—It has truly been said that no one knows what a purebred animal is worth in the hands of a competent breeder. Many examples can be given of bulls which although bought at little more than beef prices attained wide fame as sires; still more examples can be given of bulls costing small fortunes which quickly sank into oblivion after the fervor caused by their sensational sale had subsided. Obviously the price paid must conform to the resources of the purchaser. Certainly no

[3] For a description of these diseases, see "Diseases of Cattle," U. S. Dept. of Agr. Revised edition, 1923.

one of average means can afford to put more than a few hundred dollars into a single animal. Considerable information regarding current values may be had from perusing the reports of public sales in livestock papers and breed journals. Grade cows and heifers, of course, should be bought in line with current market values.

(*b*) *Buying Stockers and Feeders.*—In some sections of the country thin cattle suitable for feeding or further development can be bought locally from men who lack the feed necessary to finish them. Such cattle, if reasonably priced, are to be preferred to those shipped in from distant points inasmuch as they already are acclimated to the locality and have not been subjected to the hardships of a long rail journey.

However, comparatively few farmers east of the Mississippi River are able to secure native cattle for their feed lots. Rather, they are forced to buy on the large central markets or directly from breeders in the range states. Men inexperienced with the intricacies of the large livestock market will do well to seek the help of neighboring cattle feeders in determining where and in what manner purchases may best be made. In many cases such a neighbor will be found who will be glad to accompany the beginner to market and assist him in making his purchase.

In buying cattle on a large central market the first step is to place one's order with an authorized livestock commission company. While it is possible for the feeder to buy on his own account, the saving effected through skillful "sorting" and clever bargaining on the part of the experienced buyer is likely to exceed several times the commission charged. Most of the stocker and feeder cattle available at large market centers have been bought in small lots by stocker and feeder dealers, who sort them into lots which are more or less uniform in size and quality. Usually, however, there is need for further sorting to "cut out" unthrifty, poor-type, off-colored steers which give little promise of satisfactory outcome. Market men who have spent years buying cattle and reselling them

when returned to market after an extensive feeding period as a rule are much more adept in detecting "poor-doing" steers than are even experienced feeders. It is in this task of sorting and resorting that the aid of the commission man is exceedingly valuable.

If possible an order for stocker or feeder cattle should be placed in the hands of the commission firm a few weeks before the cattle are actually needed. This will allow time to locate cattle which will meet the specifications of the feeder much more closely than would likely be possible if the order had to

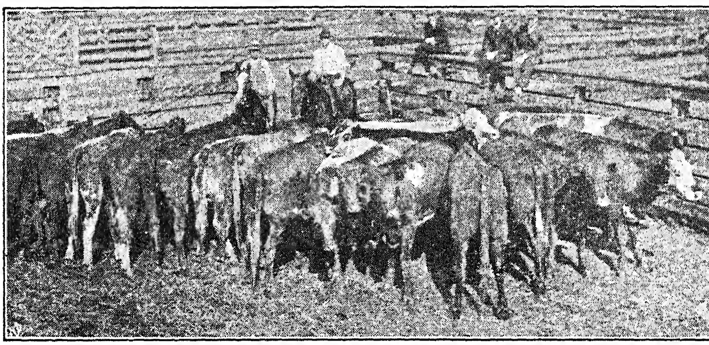


Fig. 15.—A Carefully Selected Load of Feeder Steers

Although these cattle do not possess sufficient merit to be graded as "choice" feeders, their uniform size, type, and condition of flesh make them very desirable for feeding purposes.

be filled on short notice. Frequently, by placing the order early, advantage can be taken of heavy receipts which result in a "buyers' market."

Cattle obtained directly from the range are usually purchased through an agent representing a group of western breeders or through a dealer who contracts for the cattle during the summer and later sells them out to corn-belt feeders. Frequently auction sales of such cattle are held during the fall in localities where extensive feeding is done.

Feeder cattle shipped from the range to eastern feed lots

should be "billed" through to the market where the finished cattle will ultimately be sold, with "feed-in-transit privilege" at the feeder's station. This will result in a material saving in freight, since the freight rate from, say, western Texas to Chicago is no more than it is to a point 150 miles outside of that city. Hence, in reshipping the cattle on to the market after the feeding period, the local charge will needs be paid only on the weight added by the cattle while in the feed lot.

Inasmuch as the freight charged on feeder cattle is based upon a minimum weight of 22,000 pounds for cattle and 17,000 pounds for calves, some saving can be effected by loading as closely as possible to these minimum weights. However, it is poor policy to buy more cattle than can be fed and cared for properly simply to reduce the freight charge 50 or 75 cents per head. In all probability the amount thus saved in freight will be very much more than offset by the injurious effects of overcrowding, feed shortage, etc., occasioned by the 5 or 6 additional animals. If only a half-car of cattle is wanted an effort should be made to combine with another feeder who plans to purchase about the same number, so that the full-car rate can be obtained.

FARM AND COMMUNITY STUDIES

1. Is beef production an important enterprise in your community? How do you account for this condition?

2. Locate two adjoining farms, one having a considerable number of beef cattle, and the other none. Determine, if possible, why this situation exists.

3. What opportunities does the second farm offer for the establishment of a beef-cattle enterprise?

4. Classify the farms of the community on which beef cattle are kept on the basis of the kind of beef enterprise carried on. What similarities, if any, are to be found in the farms of each class?

5. In establishing a breeding herd of beef cattle what breed would be most available: (*a*) if purebred cattle are to be bought? (*b*) if grade animals are to be purchased?

6. What reasons can you assign for the popularity of the leading breed of beef cattle in your community?

7. What is the principal source of the cattle which are fed for market in your community?

8. Ascertain, if possible, whether or not any feeders are taking advantage of "feed-en-route" privileges and if so what saving in freight is effected through such arrangement.

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NOTE. See also the references in Chapter I.

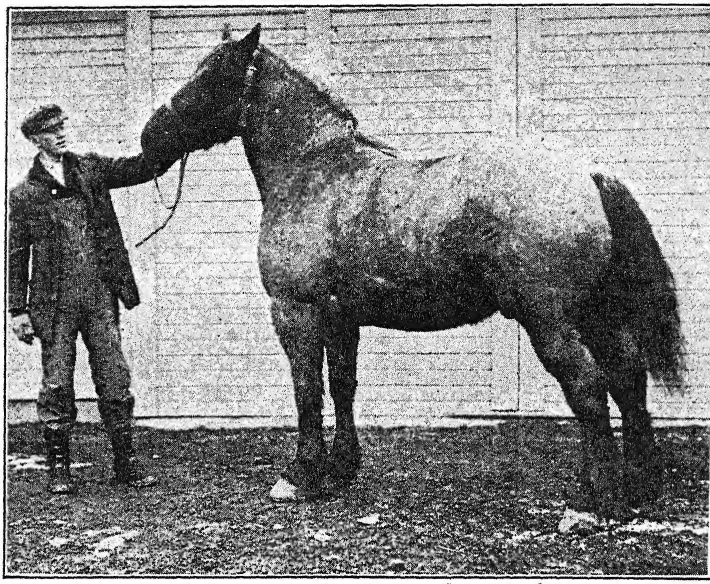
CHAPTER IV

ESTABLISHING AND ORGANIZING A HORSE ENTERPRISE

Horses and mules furnish much of the necessary power for farm work. From a farm standpoint, this is easily the most important purpose of the farm horse enterprise. The production of horses and mules, at least to the extent of raising replacement stock, is an important factor in the successful management of many general and livestock farms, for it provides farm power at a minimum cost. Moreover, the occasional sale of a surplus individual or team contributes to the farm income. On the great majority of farms, horse production should be regarded as a helpful side line and not handled as a main or specialized project. This has always been largely the case and it is further emphasized now by the greatly lessened demand for work horses on commercial jobs in town and cities.

While the production of useful farm work horses or mules will be the practical goal for most farm horse-breeding enterprises, it is also true that a limited number of riding horses of the various types may be profitably produced and used on some of the larger stock farms and ranches. They can be trained as used, sold when ready, and younger horses put in their places. The demand for safe, attractive-looking riding horses of the various types is on the increase. On any farm the boy who does not raise and break several colts to saddle and harness is missing a lot of splendid training, not only in horsemanship, but in character-building as well.

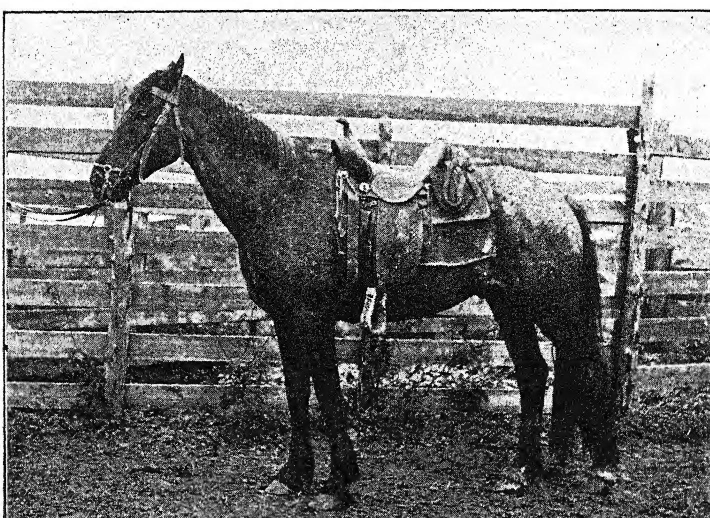
There is still a considerable but highly specialized interest in the production of both thoroughbreds and trotters for the



Courtesy of University of Illinois

Fig. 16.—A Rugged, Heavily Muscled, Easy-keeping Grade Gelding

He stands about 16½ hands high and weighs 1800 pounds. This kind is suitable for heavy hard work and is also easily sold.



Courtesy of S. M. S. Ranch

Fig. 17.—A Texas Cow Pony

race track. This is usually an avocation for the wealthy fancier rather than the livestock farmer.

Management Problems:

1. Considering the advantages of horses for farm power.
2. Determining the farm conditions under which horses can be used and produced economically.
3. Choosing a system of horse management.
4. Choosing the breed.
5. Selecting the individual and buying foundation stock.

1. Considering the Advantages of Horses for Farm Power.—The horse has several advantages as a motor for farm work; also a few disadvantages:

(*a*) Horse costs may be largely non-cash costs.
(*b*) Horses possess great reserve power.
(*c*) Horses possess flexibility and adaptability.
(*d*) Horses are not suitable for stationary or extremely large power requirements.

(*a*) *Horse Costs May Be Largely Non-cash Costs.*—Colts can be produced and work horses maintained entirely on the products of the farm, thus constituting a valuable home market for farm crops. Moreover, much of the feed used by them may be of low market value or entirely unmarketable. The feeding of marketable grain and hay to horses on the farm has its effect in reducing the surplus on the market and so tends to increase the price for that which is sold.

The labor requirements for horses may help in keeping labor profitably employed. As much as is possible of this labor should be employed during seasons of slack field work. The training of colts during the winter is an example of this kind of work.

(*b*) *Horses Possess Great Reserve Power.*—As motors, well-trained, seasoned horses possess extraordinary reserve power. This is useful in starting heavy loads and pulling them for short distances through heavy going such as mud, snow, rough surfaces, and sharp grades. The present world's pulling record

for teams under 3000 pounds is held by a pair of grade Percheron geldings weighing 2880 pounds. They exerted a pull of 3150 pounds for 27½ feet. For teams over 3000 pounds the world's record is held by a team of grade Belgians, gelding and mare, weighing 3640 pounds. Their maximum pull was 3800 pounds for 27½ feet. Both records were made in Michigan, the lightweight in 1930, and the heavyweight in 1931, in contests supervised by the State College under the rules of the Horse Association of America.

(*c*) *Horses Possess Flexibility and Adaptability.*—When horse power is used the laying-up of one unit does not stop work. Horses are partly self-guiding, and when well-trained they learn to perform many jobs without much attention on the part of the man in charge.

(*d*) *Horses Are Not Suitable for Stationary or Extremely Large Power Requirements.*—For stationary power, such as belt work used in corn shelling, etc., horses are unsuited and there is need for other power. This is also true in certain semi-arid sections where highly specialized farming is done on an extensive scale.

2. Determining the Farm Conditions under which Horses Can Be Used and Produced Economically.—There are a number of factors which contribute to the successful production and use of horses on the farm.

Considerations:

(*a*) The farm manager should have a liking for horses.
(*b*) There must be a well-balanced system of crop production and soil fertility.
(*c*) The pastures must be of good quality.

(*a*) *The Farm Manager Should Have a Liking for Horses.*—Horse production and use fit in particularly well on those farms which are managed and worked by capable horsemen and their families. Liking horses makes for success with them. The successful use of good farm horses or mules is not possible with the employment of rough, low-grade hired help.

(*b*) *There Must Be a Well-balanced System of Crop Production and Soil Fertility.*—Farms best adapted to horses are those on which well-balanced systems of crop rotations and sound soil-fertility programs are practiced. Such systems of farming cut down labor peaks and spread the requirements for horse labor over a longer period of time, thus furnishing additional hours of profitable labor for horses. Good management, through doubling and trebling the hours of labor per horse per year, has in some instances decreased the cost per hour by one-half and almost two-thirds. Under efficient management twenty-five crop acres, or in some instances even more, may be farmed per horse. Good rotations and fertile land are also valuable in that their by-products furnish good horse feed at a minimum cost.

Farms on which considerable livestock are kept are also favorable for the profitable use of horses. The horse labor used in the care of the livestock may be properly charged to them, thus reducing the cost per hour of the horse labor used in crop production and lowering crop costs.

(*c*) *The Pastures Must Be of Good Quality.*—A good horse farm must have good pastures. Regardless of the type of horse, individuals of merit cannot be raised without access to pastures which develop bone and muscle of high quality. If permanent pastures are used other classes of livestock should be allowed to run on them to prevent their becoming "horse-sick." Pastures grown in the rotation are particularly suitable for colts because such pastures are usually free from parasitic infestation.

3. Choosing a System of Horse Management.—Even though farmers appreciate the fact that there is economy in the use of horses, they frequently fail to develop the most practical systems of management for their farms.

Considerations:

(*a*) Deciding between buying and breeding farm horses.
(*b*) Deciding between grade and purebred stock.

(*a*) *Deciding between Buying and Breeding Farm Horses.*—As a rule, buying farm horses involves a greater outlay of cash than raising them. However, under conditions of overproduction of horses such as those which have occasionally occurred, it may be possible to buy work animals more cheaply than they can be raised. The experienced buyer may frequently purchase thin, undeveloped colts at a low price. He will break them, work them a year or two, feed them out, and sell them to go to districts where work horses are used but not produced. This system usually makes some profit, or at least it passes on depreciation. Farmers purchasing aged horses, because of their being well-broken, have to stand considerable loss through depreciation.

The farmer breeder has whatever profit there may be in the breeding of mares and rearing of colts. These home-bred colts should be better in quality and more easily handled than many which would be purchased. The feed and labor entailed in raising a few colts would ordinarily be missed less than the cash required for purchase. The health of the farm horses should be higher in communities where little or no buying exists, for there is not the risk of introducing disease, particularly in the case of horses which have gone through public sales or have been shipped to and from central markets.

Even on farms where colts in the main are raised for replacement purposes, there will be occasional additions to the farm income through the sale of a surplus team. Colts may be worked as threes and fours and sold as five-year-olds. The fact should not be overlooked that these young horses have pretty well paid for themselves before being sold. Farm work horses cannot be economically raised unless their dams earn their keep at farm work. Draft mares cannot profitably be carried in idleness. Furthermore, they are not likely to be regular producers unless worked sensibly. Three brood mares will raise their foals and do as much work as two geldings.

(*b*) *Decide between Grade and Purebred Stock.*—As mentioned in the introduction to this chapter, farmers will be

mostly interested in the usefulness of their work stock and this usually means that they will want grades containing some draft blood. A high-class, purebred sire should always be used. Grades can be raised and sold at less expense than purebreds.

Courtesy of University of Illinois

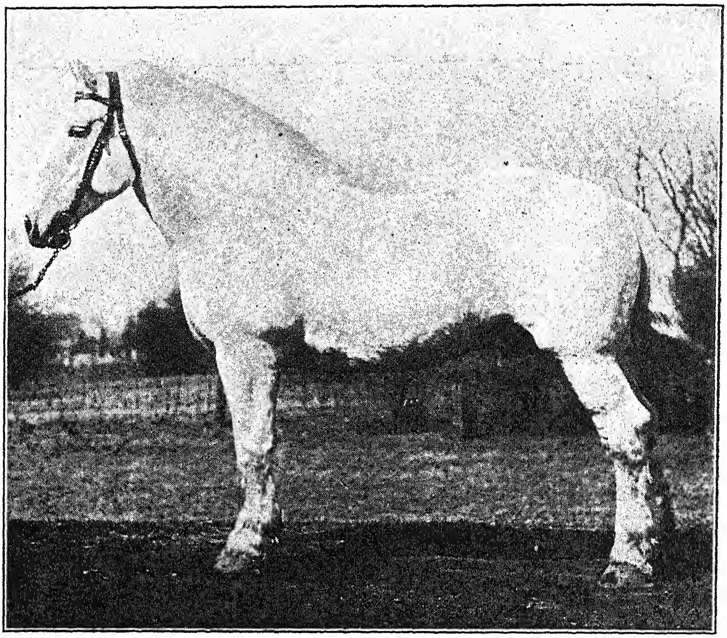
FIG. 18.—A STRAIGHT- AND FAST-WALKING SPAN OF MARE MULES

The hardy mule is a favorite source of farm power wherever the work days are long and hot.

There is less overhead, dams and service fees cost less, and there are no charges for registration or transfers. Good grades will usually bring as much when sold as the plainer sorts of purebreds. For work, they are just as satisfactory.

Crossbreeding has produced some excellent specimens of

market horses. Most experienced horsemen, however, would likely recommend staying within the blood-lines of one particular breed and improving the grades until they have approached the best purebred specimens in merit. On the other hand, if only a very inferior sire belonging to the same breed as the



Courtesy of University of Illinois

FIG. 19.—FERNAND, A SIXTEEN-YEAR-OLD PERCHERON STALLION

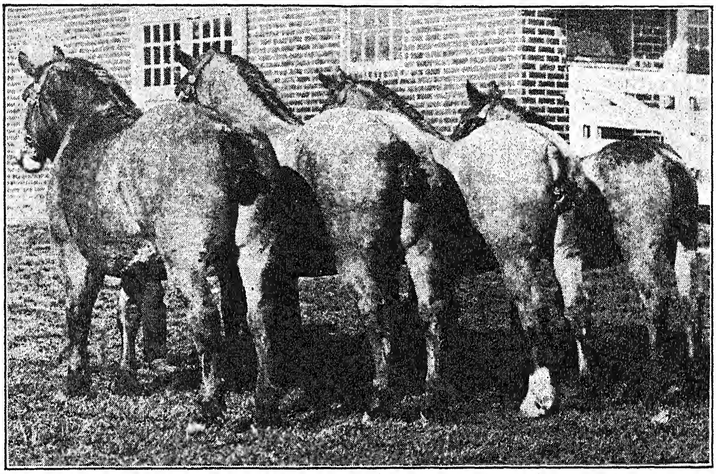
Gray in his youth. A great sire and an important winner at French shows before importation to the United States.

grade mares is available, it probably would be profitable to use a high-class sire of a different breed.

Purebreds of merit cost little if any more in the way of feed than grades. They can usually be sold to better advantage at an early age than the grades. Top purebred specimens will bring several times the price of grades. If one decides to raise

purebreds, it will be of decided advantage in many ways to select a breed in which there is popular interest and wise leadership in his community.

Mules are favored on many farms where the work is hard and there exists no opportunity to raise replacements. They are salable at all ages from weanlings up. Mules use good judgment in eating and drinking; they can be handled loose in sheds and lots with greater safety than horses; they stand heat



Courtesy of Iowa Agricultural College

FIG. 20.—A BELGIAN BROOD MARE AND A PART OF HER FAMILY

A drafty, quality type and a regular producer of meritorious foals. One mare of this sort will stock a farm with valuable horses.

well, and the expense for shoeing is likely to be less than with horses.

4. Choosing the Breed.—The Percheron, Belgian, Shire, and Clydesdale breeds are well-known breeds of draft horses. The Suffolk is a good draft horse but less widely known. The Thoroughbred, the American Trotter, and the American Saddle Horse are the important breeds of light horses.

The *Percheron* breed was brought to this country from

France. It has been a popular breed with American farmers for almost three-quarters of a century. Percherons are clean-legged, active, hardy, medium-weight, moderately low-set draft horses with excellent dispositions. The feet are usually dark-colored and of good wearing quality; pasterns are only moderately long and sloping. Bone is medium in size and good in quality; the joints are of good size and strong. The hocks, in some instances, are not set straight enough and sometimes they lack in clean-cutness. As a rule, Percherons have beautiful heads and necks. They have strong, well-muscled shoulders and well set-up withers. In body they are wide enough and, in most instances, deep enough. Backs are short, strong, and broad; croups, thighs, and quarters are heavily muscled. Short, steep croups are occasionally encountered. Percheron horses are good "doers" and "users"; they stand the heat well. The typical colors are gray and black.

The *Belgian* horse is a greatly improved type of draft horse which has been built up from the original draft horses of Flanders. No breed, within recents years, has undergone more real improvement in type and quality. They are low-set, deep-bodied, heavily muscled, rugged-boned drafters with average good action. Toplines sometimes might be straighter and heads and necks more handsome. They are easy-keepers, well liked by the farmer and by the horse buyer alike. In color they are chestnut, roan, and bay. The bay is not a popular color, nor are the occasional black and gray colors well liked. The Belgian stallion is a good horse for crossing purposes. It has made a real contribution to draft-horse breeding in many communities in the United States where the mare stock lacked size, bone, and general draftiness.

The *Shire* horse is the Englishman's main contribution to the world's draft-horse industry. Shires are especially noted for their big size, heavy, rugged bone, and straight draft-horse action. The English breeders have emphasized the production of specimens with profuse "feather." Although this feature is seldom objectionable in grades, it has interfered with

the breed's popularity in America. Occasional specimens would be improved by greater quality in feet and legs and by the addition of length and slope to their pasterns. Colors are bay and brown, oftentimes with white points; occasional

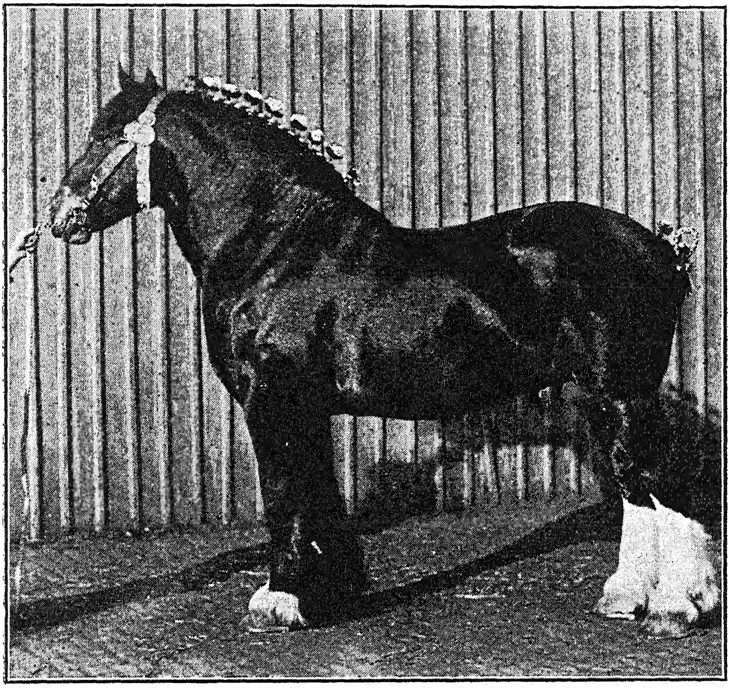


Photo by Hildebrand

Fig. 21.—Shire Stallion Lockinge Hengist

Exceptionally clean, flat bone and big, strong, well-set joints. Note the neatness and attractiveness of his show-ring decorations. Imported by Trumans and later owned by George Stoll.

chestnuts, blacks, and grays occur. The quality Shire stallion has been a good horse for crossing purposes. The grade Shire mares, which formerly existed in the Middle West in larger numbers than they do at present, were the dams of many excellent market horses.

The *Clydesdale* is the pride of the Scotch farmer. The best specimens, according to Scotch standards, are well-nigh perfect in feet, pasterns, bone, hocks, and action. Scotch breeders have gone after and successfully obtained big, round feet which are open at the hoof-head and wide at the heels; long

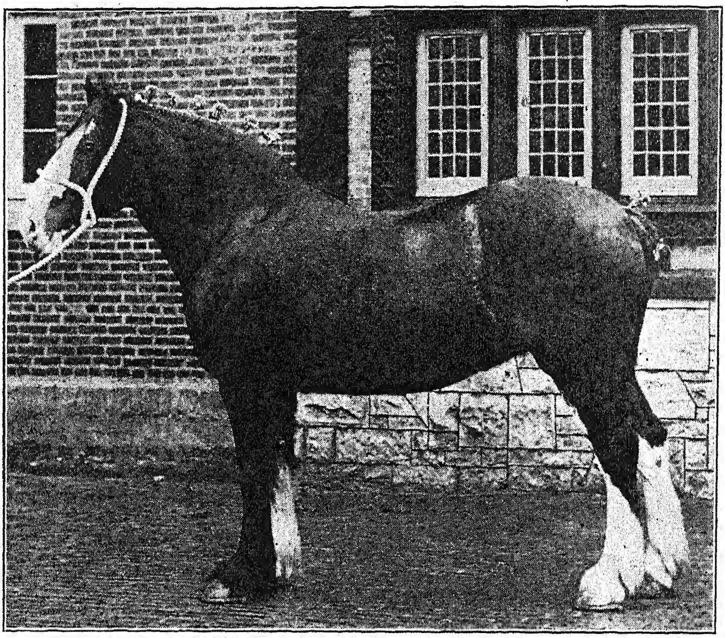


Photo by Hildebrand

FIG. 22.—CLYDESDALE MARE HARVIESTON BARONESS

Clean, quality bone and joints. Note the sloping pasterns. Owned by R. A. Fairbairn.

sloping pasterns; razor-like quality bone; straight, silky feather, and deep, strong, sound, correctly-set hocks. The action in this breed is straight, true; hock action close; the stride is long and springy. Clydes are extra good walkers; at farm work they can cover a lot of ground during a day. In draftiness of body too many specimens are decidedly lacking in

width of chest, depth of rib, and muscling. These defects are being overcome by Scotch breeders. In disposition, this breed has plenty of life and ambition; some would say a little too much. In color, they are bays and browns, frequently with

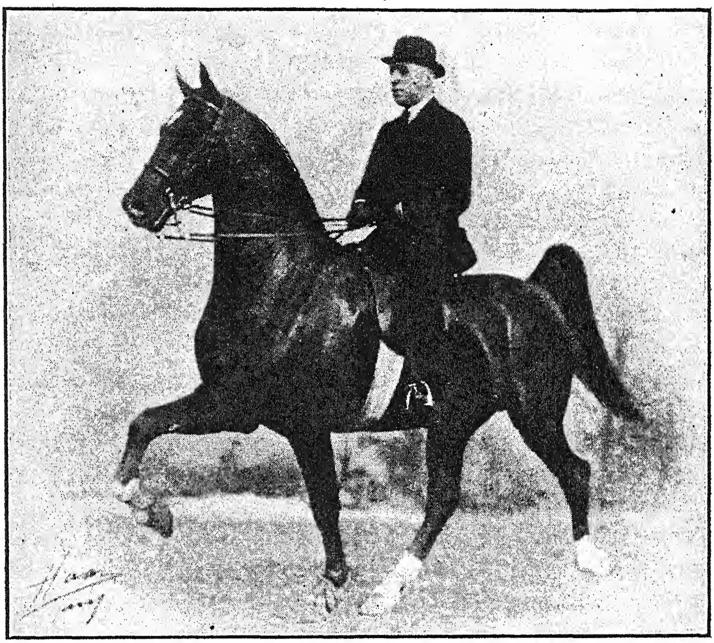


Photo by Haas *Courtesy of Horse Association of America*

FIG. 23.—FIVE-GAITED SADDLE STALLION, THE FEUDIST

The American Saddle Horse is extremely handsome and useful in both the three- and five-gaited form. Owner, Minton Hickory Stable.

white points and white on the body. There are a few blacks, grays, and chestnuts.

The *Common Breeds of Light Horses* are the *Thoroughbred,* the *American Trotter,* and the *American Saddle Horse.* The *Thoroughbred* is the breed which supplies the running tracks with contestants. Farmers are sometimes interested in the Thoroughbred stallion as the sire of road-hacks, hunters, or

polo ponies. The Thoroughbred has contributed much to the improvement of practically all breeds and types of light horses. The Thoroughbred sire is favored by many army officers. In his highest estate the Thoroughbred is a magnificent horse.

The *American Trotter* is a tribute to the skill of breeders in the United States. This breed supplies the light-harness horses seen on our trotting tracks and in the show ring. Formerly much in demand for road purposes, and even for the lighter jobs on the farm, this breed is now mostly bred for track purposes.

The *American Saddle Horse* is likewise an American creation. From this breed are produced probably the handsomest horses in the world. The five-gaited saddler of the show ring belongs to this breed; also the high-selling three-gaited type known as a park hack. In addition, many useful riding horses on farms and plantations owe much of their merit to this breed.

5. Selecting the Individual and Buying Foundation Stock.—It is of great importance that good judgment be used in the selection of foundation stock. The development of skill in horse judging is worthy of careful, painstaking development. The farm boy who is interested in horses should try to gain experience under capable horsemen, for skill in this field is usually a matter of apprenticeship to someone who really knows, plus diligent study and wide observation. Horse breeding, at best, is a time-requiring job. Mistakes are costly and they are hard to rectify. Go slowly in buying your foundation; patronize only men and firms of reputable character.

Procedure:

(*a*) Select for soundness.
(*b*) Select for a useful draft type.
(*c*) Choose a family of consistently good breeders.
(*d*) Select brood-mares of desirable type.
(*e*) Select a stallion with ability to transmit desirable characters.

(*a*) *Select for Soundness.*—In selecting breeding stock, consistently avoid unsoundnesses of the type the tendency to

which is likely to be transmitted. Among such unsoundnesses may be mentioned roaring, moon-blindness, side-bone, ring-bone, bone-spavin, bog-spavin, and string-halt. Not infrequently the farmer may use plain horses, not too sound, for work purposes, and do it profitably because of their low purchase price. However, if he is to breed horses, he must have stock which will produce both soundness and acceptable type. The best available are none too good, and both time and money are conserved by starting with the highest-class foundation material which is available. Remember, too, that a bad disposition in an animal may be the source of greater loss and discomfort than a serious unsoundness. Men are intimately associated with the horses they work, and cleverness and cheerful, willing dispositions are as valuable traits in a horse as they are in a man. Life is too short to bother with horses which are naturally vicious; happily there are few of this sort.

(*b*) *Select for a Useful Draft Type.*—Size, even in a draft horse, should never be emphasized at the expense of soundness, quality, and action. From the standpoint of work, these things are worth more than many pounds of weight. Size is desirable, of course, provided you get the important qualities which make for long wear with it. For breeding purposes, particularly, avoid the over-grown sorts, the kind that owe their weight to high condition rather than to heavy frames and naturally big muscles which are a result of both heredity and feeding. Individuals which are much larger than their immediate ancestry seldom breed on their size.

High condition, such as is frequently entailed in fitting for the show ring, in either stallions or mares, is a source, in some instances, of very considerable loss in breeding returns to draft horsemen. Young things—foals, yearlings, and twos—may be moderately fitted with little or no danger. The draft stallion, in breeding condition, that stands 16.2 to 17 hands and weighs 1800 to 2000 pounds is big enough. The 16.2 mare weighing 1600 to 1800 pounds in work condition usually proves more successful for the farmer breeder than the sort 200 or 300

pounds heavier. Horse values rest largely on utility, and in the draft horse this utility is the ability to live on the moderate-priced products of the farm and to work and to work hard. Utility as a farm horse should be kept in mind.

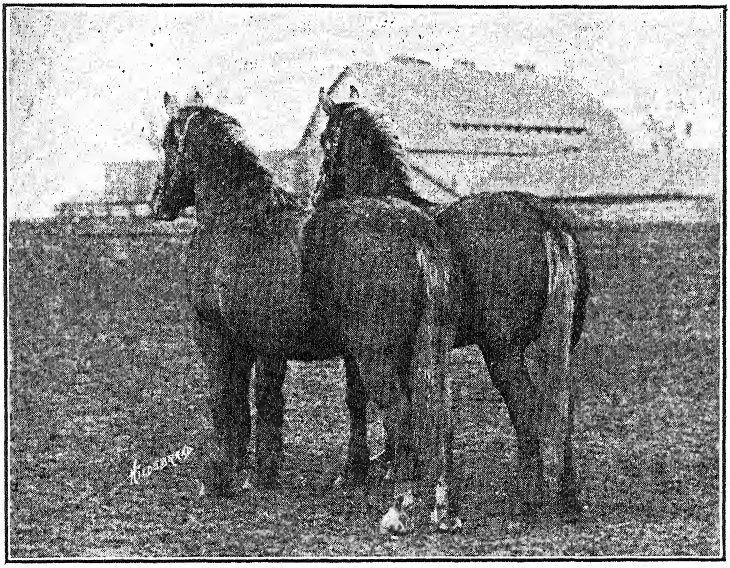
(c) *Choose a Family of Consistently Good Breeders.*—The family is important. Ideal foundation stock consists of individuals of merit which come from families which average high as breeders. The good individual belonging to a mediocre or low-grade family is practically always a failure as a breeder. Value is by no means altogether judged by outward appearances, important though they may be. Regular, successful breeding habits are a matter of inheritance as well as environment. The regular production of good things is needed for success. It is much more profitable to have " doers " that are possibly a little plain in type than to possess fancy show types which do not " deliver the goods " in the way of offspring and work in the collar. Time is a factor in getting real merit together in the case of horse-flesh.

(d) *Select Brood-mares of Desirable Type.*—There are a number of considerations governing the age at which mares may best be bought for breeding purposes. Mares, four to ten years of age, which have been regular producers, are likely to do well in their new homes. There is little risk entailed in buying fillies, provided they come from sound, regular breeding mares of good type. " Agey " mares, unless one can be sure of a good record and of the health of their reproductive organs, are likely to be " chancy " buys. Diseased reproductive organs are by no means an uncommon occurrence in mares. Many diseased conditions are difficult or impossible to cure. It is always better business to buy good brood-mare prospects than " tried " failures. A purebred filly or mare should be worth about twice the price of a grade of equal merit.

Femininity, type, and roominess are always to be desired in the brood-mare. All too often the farmer has kept and used for brood-mares the sorts which the horse-buyer left behind because they were not good enough to buy for reselling. With

such practice no improvement in the herd is possible. The light-bodied, upstanding mare with a "frothy" disposition is almost always a failure as a brood-mare.

(*e*) *Select a Stallion with Ability to Transmit Desirable Characters.*—The kind of a stallion to which the breeder has access may "make or break" his horse-breeding venture. The average breeder has to use the mares he already possesses



Courtesy of University of Illinois

Fig. 24.—Sound Two-year-old Percheron Fillies of Good Type

Satisfactory foundation material for a Percheron breeder.

and so looks to the stallion for improvement. The stallion should be sound, well-bred, and typical of his breed and should be registered. He should be a vigorous, sure breeder and should be well fed, regularly exercised, and not abused by over-use. To be successful he must be in the hands of a capable caretaker. Many a promising stallion has been ruined through ignorance and carelessness. No trouble connected

with horse-breeding is more discouraging and provoking than trying to get mares safely settled in foal to an impotent stallion.

If the stallion is a draft horse, a good test of his merit is the answer to the question—Would he have made a sound, high-class, market-topping gelding if he had been castrated as a yearling? When all is "said and done," however, the very best proof of a stallion's real value is the quality of his colts—Are they highly appreciated and do they sell well? Stallion prices vary, of course. Occasionally tried sires may be had at a very reasonable price. The stallion which gets, say, fifty foals per year, which are worth $40 more per head as three-year-olds than the average three-year-old, adds $2000 annually to horse values in his community. It is a mistake to try to save five or ten dollars on the service fee and lose fifty dollars on the quality of the three-year-old colt.

Foals, yearlings, and two-year-olds purchased from their breeders and grown out by the buyers cost much less than the more mature horse which is capable of immediately going out and taking care of a big season's business. The draft stallion may be privately owned; frequently he is purchased by a group of farmers. There is bound to be considerable expense attached to the buying, fitting, and selling of stallions under any form of company or club plan. However, if farmers do not wish to do this organization work themselves, it is necessary to pay someone else for doing the work and taking the risk. The important things to know are that you are getting a good stallion and are patronizing an honest firm which will back up its guarantee.

Some careful figuring will be necessary to make a commercial success of a stallion. How many mares can be secured and what service fee will owners pay? The stallion, whether individually or company owned, should return the original investment with interest and expenses in three seasons. Liberal service fees, which are paid, are necessary to make ownership of good sires profitable. Cheap stallions and low fees of necessity must go together.

COMMUNITY STUDIES

Study the use and production of horses on farms where horses are the most important source of farm power and also on farms where tractors are extensively used.

1. What are the factors which make animal power economical:
   (*a*) Cash outlay?
   (*b*) Making a home market for farm feeds?
   (*c*) Flexibility and adaptability?
   (*d*) Time serviceable?

2. What are the factors determining whether work stock shall be produced or bought:
   (*a*) Skill and interest of owner and family or manager?
   (*b*) Crops grown? Amount and quality of pasture?
   (*c*) Livestock other than horses?
   (*d*) Opportunities for buying and selling?

3. How do the market demands in the community for purebreds compare with the demand for grades:
   (*a*) Popularity of the different breeds?
   (*b*) Reason for breed preference?
   (*c*) Interest in pleasure horses?

4. How was the start made with horses:
   (*a*) Preference as to type?
   (*b*) Attention to breeding qualities?
   (*c*) Importance attached to keeping brood-mares of merit?
   (*d*) Effort made to mate the brood-mares with stallions of excellence?
   (*e*) Communities' methods of purchasing stallions?
   (*f*) Attention paid to soundness?

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Note: See also the references in Chapter I.

CHAPTER V

ESTABLISHING AND ORGANIZING A SHEEP ENTERPRISE

SHEEP raising is not an extensive enterprise on many farms. Most farmers who have sheep maintain them as a part of a diversified system of livestock farming. Under such conditions the sheep are generally considered as a side line and are given the compliment of living on what are usually thought of as waste feeds and weeds. As weed consumers, sheep have long held a unique place on farms and as an aid in maintaining the fertility of the soil they have been highly esteemed for centuries. When farm flocks are well managed they often produce a high return on the investment although they may be among the minor enterprises of the farm.

The purchase and feeding of western range lambs is a phase of sheep production which is followed by many farmers in certain areas of this country. The term "lamb feeding" as used in this text refers to this type of sheep husbandry. The main products of the sheep, meat and wool, if of good quality, are generally wanted by enough people to create good markets for them.

Management Problems:

1. Considering the possibilities of sheep.
2. Determining conditions most suitable for sheep raising.
3. Deciding between keeping a farm flock and lamb feeding.
4. Deciding on the size of the flock.
5. Choosing the type and breed.
6. Selecting sheep.
7. Buying sheep.
8. Planning the management.
9. Studying results.

1. Considering the Possibilities of Sheep.—Sheep raising can be made to contribute substantially to the income of the farm. The possibilities of profitable returns from a flock are greatest when the products of each sheep—wool and lambs—are of high quality, large in amount, produced at low cost, and marketed successfully. Not all sheep, of course, produce the same quality or amount of wool. Neither do they produce the same quality or number of lambs. There is a limit to which a sheep can produce and this limits the returns. It is well to know what these limits are. For most farmers it will be very difficult to raise to market weight more than a 150-percent lamb crop. In other words, 75 lambs from a flock of 50 ewes is a reasonable limit to expect; on some farms this has been exceeded. Likewise, 10 pounds of wool per ewe is a reasonable limit in farm flocks.

The net amount which may be secured from a flock will be limited by the costs of production. These costs are made up of many items, which are not the same on any two farms nor are they equal from year to year. The more important costs and the approximate percentage each represents of the total are as follows:

Grain and dry roughage	35%
Pasture	30
Labor	15
Death loss and depreciation	10
Taxes, interest, and miscellaneous items	10
	100%

By assigning values to each item an idea can be obtained of the actual costs. Likewise, one can use what he believes to be conservative prices for lambs and wool and develop a fair estimate of the income which may be expected.

Lamb-feeding enterprises, also, possess certain possibilities and limitations. An average feeder lamb, for example, weighing 60 pounds may be increased to a weight of 85 or 90 pounds by feeding about 2 bushels of corn or equivalent and from 125

to 175 pounds of legume roughage. By knowing the approximate amounts of feed which will be required for definite increases in weight, one can estimate the possibilities in "marketing feeds" in this way.

The possibilities of profit in lamb feeding are limited mainly by the cost of feeding, death losses, overhead expenses, and the margin, or spread, between buying price and selling price per hundred-weight. None of these factors is under the complete control of the feeder.

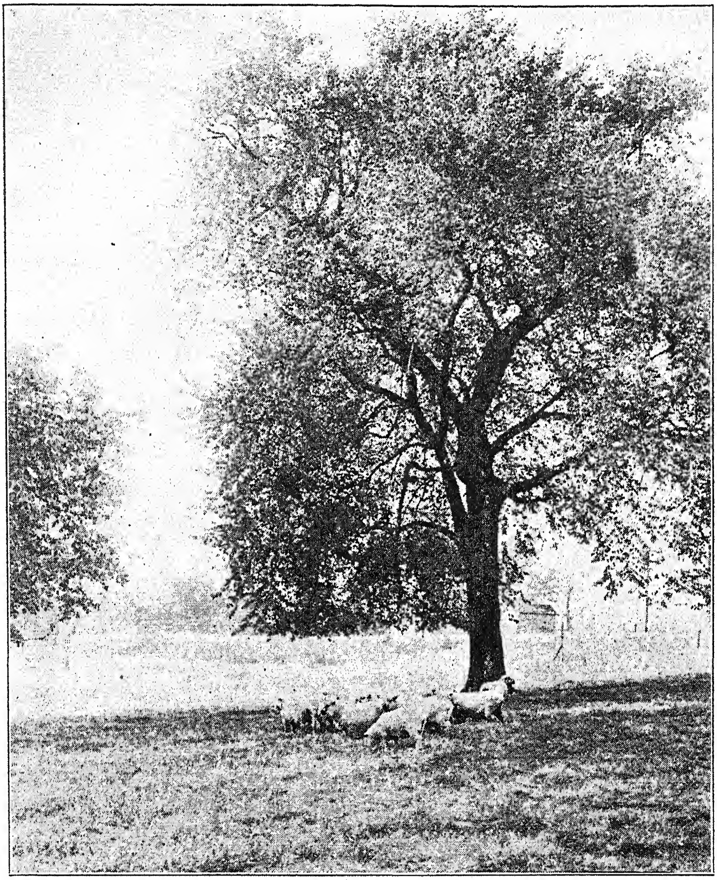
2. Determining Conditions Most Suitable for Sheep Raising.—Although sheep are raised in almost every locality, certain areas are generally considered more suitable than others for these animals. Sections in the higher altitudes where the physical features of the land are favorable to pasturage are considered as being especially adapted to modern sheep raising. Sheep show a preference for the great variety of short grasses, herbs, and small bushes usually found on such areas. The preference of sheep for the high, well-drained sections to lie down on at night is often cited as indicating the fitness of such localities for sheep raising.

Certain breeds have been kept for many years upon the fertile, level lands of the lower altitudes. Such localities may now be thought of as being entirely suitable for sheep raising. Many of the roughages, especially the leguminous, grown in crop rotations on fertile lands are valuable for sheep.

A farm on which it would be difficult to grow good roughages or provide good pasture would not be adapted to sheep raising. Any farm that is very low and wet during a large part of the year or that is heavily infested with poisonous weeds would require many changes to make it satisfactory. A lack of natural shade and of a good water supply reduces the value of a farm for sheep raising. Adequate fences which enable one to provide change of pastures and to utilize the waste roughages in all fields are a decided advantage on a farm to be used for sheep raising.

Sufficient buildings to afford ample shelter during winter

are another requirement for which provision must be made. Except in the northern sections where the winters are severe,



Courtesy of University of Illinois

FIG. 25.—A SUITABLE SHEEP PASTURE

Farms producing an abundance of nutritious pastures and roughages are most suitable for sheep.

a shed which is open on the south will be satisfactory. A shelter of this kind will protect the sheep and not be unduly

expensive. It is generally suitable for lamb feeding, but lacks facilities for the storage of feeds and in many places is not warm enough for very early lambing. From 12 to 16 square feet of floor space will be required by an ewe, and 6 to 10 square feet by a feeder lamb.

It is questionable if sheep raising can be profitably conducted in localities where lands are very high in price, because of the competition of producers occupying much cheaper lands. Nearness to market is not a necessity if good transportation facilities are available. The "feed-in-transit" privilege offered by some railroads is a very marked advantage to lamb feeders.

3. Deciding between Keeping a Farm Flock and Lamb Feeding.—In taking up a sheep enterprise there is a choice between maintaining a farm flock and carrying on lamb-feeding operations, that is, purchasing thin, lightweight lambs produced on the range areas and feeding them until they can be marketed as fat lambs. The most apparent *advantages of the farm flock* may be listed as follows:

(*a*) It does not require a regular cash outlay each year for animals.
(*b*) If of sufficient size it may be a great aid in the control of many weeds.
(*c*) Pastures and roughages will supply most of the necessary feed.
(*d*) Financial loss is not likely to occur when good practices are used.
(*e*) Two products—lambs and wool—are secured.

Some of the *advantages of lamb feeding* over maintaining a farm flock are as follows:

(*a*) Lambs may be kept for a short period only and they may not be subject to taxation.
(*b*) Internal parasites are generally not troublesome if thrifty lambs are bought.

(*c*) The number to be handled can be readily changed to correspond with feed supplies and other conditions.

(*d*) It is usually much easier to borrow money to purchase feeding lambs than breeding sheep.

4. Deciding on the Size of the Flock.—The size of the flock to be kept is an important consideration. Many farm flocks are too small—so small that they are almost certain to be

Courtesy of University of Illinois

FIG. 26.—BREEDING EWES

Carefully selected ewes from the western ranges possess many desirable features for farm-flock purposes. When mated with mutton-type rams they produce desirable market lambs.

neglected because the returns from them will not justify the attention they should have. Experience with sheep may be secured, of course, from a small flock; however, the smaller the flock the more limited the experience gained is likely to be. It is better to have a flock of practical size and to overcome lack of experience by reading books and articles pertaining to sheep and by visiting the flocks which are being successfully managed by others in the community.

If sheep are raised on a farm of 160 acres the flock should consist of at least 40 ewes. If this number is too large to fit into the farm plans, then it is doubtful if sheep should be included as a livestock enterprise.

Among the *advantages of a flock of about 40 breeding ewes* the following are important:

(*a*) Equipment costs less per head than for a smaller flock and one is justified in providing suitably fenced pastures and a good shelter.

(*b*) The labor required to care for a flock of this size is but slightly more than that to care for 10 or 12 head.

(*c*) With a flock of 40 ewes the owner can afford to purchase a ram which will improve his lamb crop. With a very small flock the cost of a good ram would be prohibitive.

(*d*) Marketing the lambs and wool of a flock of good size is of sufficient importance to justify careful attention on the part of the owner in preparing the products, and buyers are usually more interested.

(*e*) If the flock is purebred the advertising costs per head are reduced and more extensive advertising can be undertaken.

Larger flocks than 40 breeding ewes are frequently found on farms and may be advisable under the conditions.

In buying sheep, particularly on central markets or in range areas, it is often an advantage to purchase at least a single-deck carload. This would include about 100 ewes or 150 feeder lambs. Feeder lambs are generally handled in double-deck carloads of approximately 300 head. This number would make three "decks" when shipped to market weighing about 85 pounds per lamb.

5. Choosing the Type and Breed.—On the basis of the kind of wool produced, sheep breeds are generally grouped into three types. The medium-wool group includes Shropshire, Southdown, Hampshire, Oxford, Dorset, Cheviot, Suffolk, and

Corriedale. The Lincoln, Leicester, Cotswold, Romney, and Karakul constitute a group referred to as coarse- or long-wooled sheep. The fine-wool group includes the American Merino, Delaine Merino, and Rambouillet.

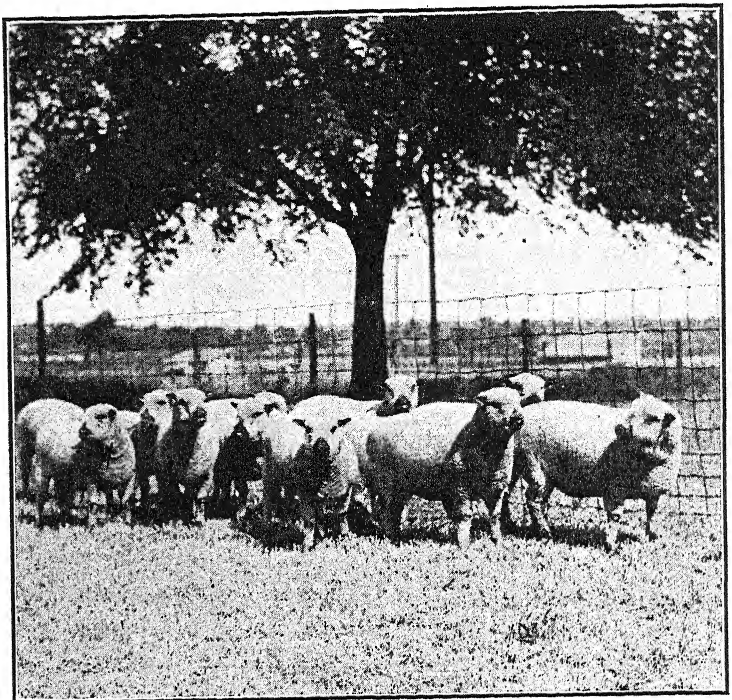
The medium-wool breeds are the leading mutton sheep. All the breeds in this group, discussed here, have dark faces except the Dorset, Cheviot, and Corriedale, which are white-faced. All the long-wool breeds are characterized by large-size, long, loose fleeces, and white face and leg markings. On most markets the meat of the long-wool breeds is not considered as of high quality. Fine-wool sheep are white-faced. They differ much in appearance from the other breeds because of the folds in the skin and general lack of good mutton qualities.

In general the medium-wool type of sheep is much more widely used in farm flocks than either of the other two types. In some sections of the country there are many flocks of the fine-wool and some of the long-wool breeds. In the western range states the majority of the ewes in the flocks represent fine-wool breeds or a cross of fine- and long-wool breeds.

There are many breeds of sheep and each has its advocate. In making a selection the unbiased opinion of a well-informed person is generally a safe guide. It is frequently advisable to choose a breed already established in the community rather than to introduce one that is foreign to it unless those already there are not suited for the purpose in view. As between the breeds generally found in a locality the personal choice of the one who is to handle the sheep should be given consideration. Of course most flocks will not be purebred sheep, but if they are well-bred grades they will show many characteristics of the breed represented.

The important points of a breed are its constitution, the lambs and wool the ewes will produce, and the way these meet market requirements. Breeds which will produce good market lambs and also heavy fleeces of good marketable wool are highly desirable. With most breeds the sales of lambs under farm conditions will usually represent from 60 per cent to more

than 80 per cent of the gross income from the flock. When many twin lambs are raised the percentage income from lambs will be considerably higher than when only a small number are raised. No matter which breed is chosen there will be some



Courtesy of University of Illinois

FIG. 27.—PUREBRED SHROPSHIRE EWES

It is important to consider the characteristics of the various breeds, but it is equally important to obtain good representatives of the breed selected.

individuals in the flock that will far surpass others as producers. To attain the highest possible degree of success, it will be necessary to cull and improve the flock so that all the animals will be good producers.

Studying the Various Breeds.—*Shropshires* are a medium-sized, well-proportioned breed of mutton sheep that produce good quantities of marketable lambs and wool. The lambs if well fed grow rapidly, attain market weight at about 4 months of age, and yield carcasses of high quality. Mature ewes generally produce from 8 to 10 pounds of wool yearly. Because of these features the Shropshire is well adapted to farm sheep raising and is popular in many of the farming sections.

Southdowns have been developed to produce the very choicest market lambs. Because of their low-set, broad, compact, well-fleshed bodies, their great quality, and their marked tendency to fatten readily, they are looked upon as the ideal mutton sheep. They are sometimes criticized because the fleeces are short and weigh only 5 or 6 pounds. There has been some criticism, also, because the Southdown is not as large as the Shropshire. However, the rams are very suitable for mating with grade ewes to produce choice lightweight lambs.

Hampshires are larger than the Shropshires. They do not show the quality or refinement of the Shropshire in either body or fleece. They have many staunch supporters as being adapted to both farm and range. The lambs are noted for their rapidity of growth under good conditions. Hampshire ewes are prolific. They are good milkers. The yearly wool production averages from 7 to 9 pounds.

Oxfords are similar to the Hampshire in size but probably weigh a little more at maturity. They produce fairly long wool in large quantities, 10 to 12 pounds or more in case of mature ewes. Oxford lambs produce good carcasses if fattened as suckling lambs; otherwise they tend to become heavier than is usually desired for choice market lambs. There are many flocks in the central states showing the influence of Oxford blood. The size of the Oxford wins favor with farmers.

The *Dorset Horns*, or *Dorsets* as they are usually called, are not numerous in this country. Many of them are deficient in quality and for sheep of their size shear light fleeces, about 7

pounds. They have been used in the production of "hothouse" lambs (those born in late fall or early winter) because the ewes will breed at seasons when most ewes of other breeds will not. Some Dorset and Delaine Merino crossbred ewes are kept for the same purpose. In this way the shearing qualities of the flock are greatly improved and the lambs sired by Southdown rams fulfill the demands of this special trade. The Dorsets are vigorous and hardy. The ewes rank high in prolificacy and are noted as milk producers and lamb raisers.

Cheviot sheep are distinctly attractive in appearance. They are very hardy, alert, and active and are particularly adapted to rough country similar to their native home. However, they thrive well in the fertile sections although they have not attained there the popularity of the "black-faced" medium-wool breeds. Many of them are deficient in smoothness of form in the forequarters. The fleece weight is from 5 to 7 pounds. Fat Cheviot lambs often yield carcasses of excellent quality.

Suffolks are a very active, somewhat upstanding, rangy breed. They have been developed especially for meat production. The wool does not extend well over the body and the fleeces not only are light but very often contain large amounts of black fibers. Very few sheep of this breed are found in the central states. Suffolk rams are used to some extent in the western range areas to sire market lambs.

The *Corriedale* is the result of crossing long-wool and fine-wool sheep in an attempt to develop a breed that would produce good market lambs and large amounts of wool. In general conformation they are similar but hardly equal to the Shropshire. As a rule they are somewhat smaller than the Shropshire. Corriedale ewes shear from 10 to 12 pounds of wool yearly. The wool is of good length and medium grade. The ewes are good mothers and their lambs by either Corriedale or other medium-wool rams are satisfactory for our markets. Most flocks of this breed are in the range areas.

Lincoln sheep are very large, broad, and deep. Mature

rams often weigh more than 300 pounds. Good flocks of Lincoln ewes average about 15 pounds of wool per sheep annually. The wool is coarse and from 8 to 12 inches long.

Cotswolds, like Lincolns, are very large and their carcasses, too, may be of secondary quality. The wool attains a length of 10 to 14 inches and fleeces average about 14 pounds. The wool on the hindquarters is often defective in flocks which are not carefully selected. The ewes are good mothers, fairly prolific, and their lambs grow well but do not finish readily at an early age or light weights.

Leicester sheep are not so large as Cotswolds or Lincolns but have more quality. They are rectangular in outline. They are not well adapted to careless shepherding. The ewes in general are not considered very prolific. Fleeces are not so long as those of the Cotswold or Lincoln.

The *Romney* is very hardy and especially adapted to grazing on lowlands, although it also does well on rolling areas. Compared with other long-wool breeds, the fleece is shorter and somewhat finer. Romney rams are commonly used in some sections of the West to cross on fine-wool ewes. The crossbred ewes are then bred to medium-wool rams for market lamb production.

Karakuls are not strictly long-wool sheep. They are not numerous in this country although many attempts have been made to promote their use for fur production. The lambs at birth usually have a tightly-curled coat resembling fur. The pelts are used for making fur coats, especially for women. Trade terms used in referring to the skins are Broad-tail, Persian lamb, Caracul, Astrakan, and Krimmer. The value depends upon the tightness of curl, luster, and color. The mature Karakul has very coarse wool, often of mixed colors. This breed has no special features of superiority over other breeds except the character of pelt which may be obtained from very young lambs.

The *Rambouillet* is now the predominant breed of fine-wool sheep, as it has superseded the Merino in most of the western

areas because of its greater size and more mutton-type form. These sheep are very hardy and long-lived. They shear heavy fleeces of fine combing and clothing wool. Except in occasional flocks, the ewes are not quite so prolific as most medium-wool breeds. However, they will breed readily in July or August and produce good early lambs when mated to rams of the mutton breeds. Many farmers have objected to them because of the folds of skin on the neck and body, which make them hard to shear. Some breeders are attempting now to produce Rambouillets free from most of the folds yet possessing all the other desirable characteristics.

Merino sheep are generally grouped into three types according to the folds in the skin and body size. The A-type is heavily folded on all parts of the body. This type is small and produces fine, short, very greasy wool. It is found mainly in Ohio and is not regarded by many as a practical farm sheep for present conditions. The B-type is larger and has only a few folds on the body. The C-type is often referred to as the Delaine. Skin folds may be found only on the neck; on some animals they may be entirely absent. The wool of the Delaine is fine but it is longer and contains less oil than the heavier "marked" (A- and B- types) Merinoes.

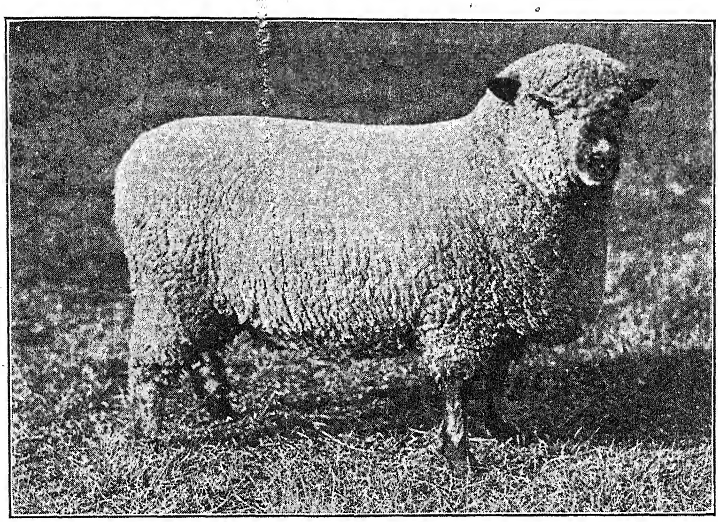
6. Selecting Sheep.—One of the most profitable things the flock owner can do is to select his animals wisely. The tendency of many sheep men is to consider what they have or purchase as good enough. Selection is important in starting a flock; it is equally important after it is established. There are certain characteristics to be looked for in the mature rams and ewes used to start a flock, and after the flock is on a producing basis, there are other points which should be considered in selecting lambs to be added or in deciding which ewes to discard.

Considerations:

(*a*) Selecting ewes of promising ability.
(*b*) Retaining lambs from only the efficient ewes.
(*c*) Selecting a well-bred ram.

(*a*) *Selecting Ewes of Promising Ability.*—In selecting ewes to establish a flock, the considerations generally thought to be of most importance are constitution, health, soundness, age, size, body form, fleece qualities, femininity, and uniformity.

Good constitution is indicated by a deep, wide, roomy body. Sheep that have good constitutions have a sturdy, strong



Courtesy of University of Illinois

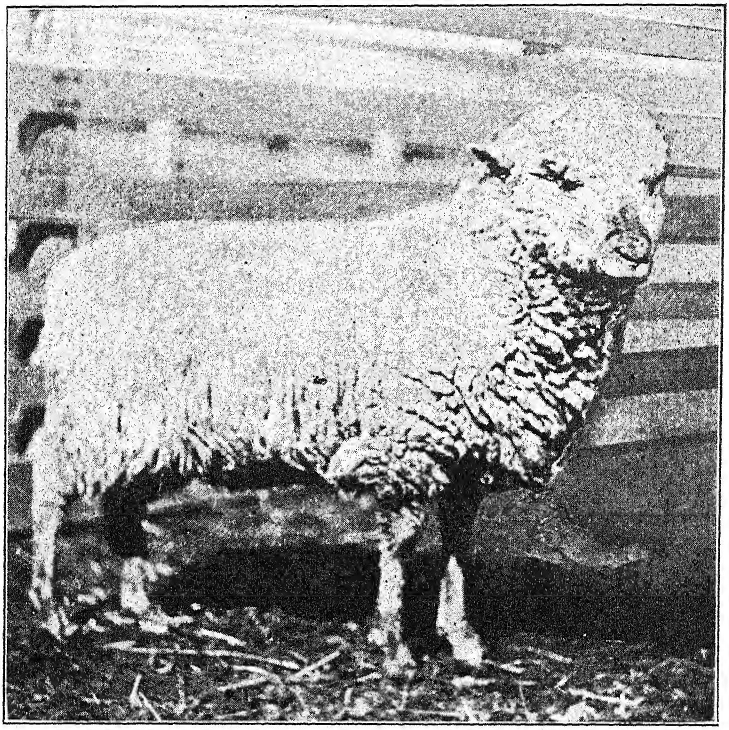
Fig. 28.—A Good-type Ewe

Note the evidences of producing abilities in this ewe as compared with the ewe shown in Fig. 29.

appearance. They are able to withstand reasonable hardships and the strain of regular production. Strong constitutions are not found in the very narrow, shallow-bodied, fine-boned, weak-appearing ewes.

Health is necessary for good performance. Any indications of ill health reduce the value of a sheep and increase the risk in purchasing.

The term soundness is generally used in referring to the condition of the mouths and udders of ewes. In purchasing ewes, the mouths should be examined to learn whether or not the teeth are all present and in good condition. Avoid "broken-



Courtesy of University of Illinois

FIG. 29.—A POOR-TYPE EWE

In buying sheep give most attention to health, constitution, conformation, and fleece. No characteristic of this ewe indicates that she is a suitable type.

mouthed" ewes and "gummers." Examine the udders and do not purchase ewes whose udders show any abnormal condition.

The age of sheep is estimated by the appearance of the teeth.

Ewes are at their best as producers of both lambs and wool when two to six years of age.

Size is important. This does not mean that the larger breeds should be used, but that in a group of ewes those of average or above average size for their breed are likely to be more satisfactory as lamb and wool producers than the undersized ewes. Very small ewes seldom have enough feed and milk capacity to raise twin lambs as well as larger ewes.

Conformation, or body form, in ewes indicates to some extent the kind of lambs they will produce. Those with deep, roomy bodies and strong backs will be found to be the best producers of lambs. Avoid ewes with extremely long legs and those noticeably lacking in muscular development.

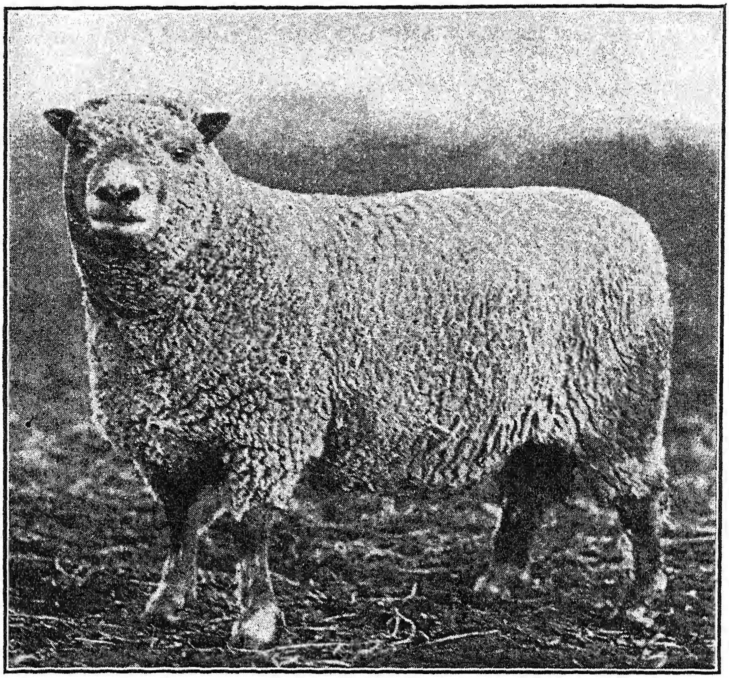
Select ewes that have fairly dense fleeces. Also, see that the wool has fair length, as length influences the weight of the fleece and its value. Ewes with little or no wool on the underline or those that have readily noticed defects in the color or the quality of wool are unsatisfactory.

Coarse, "staggy" ewes are lacking in femininity and very often are poor producers.

Uniformity in size, in conformation, in breeding, and other features adds to the attractiveness of the flock and to the value of the lambs.

(*b*) *Retaining Lambs from only the Efficient Ewes.*—After the flock has been established and selections of ewe lambs are being made from those raised in the flock, attention should be given to still further points than those listed above. Three are especially important. These are prolificacy, lamb-raising ability, and wool production. Ewe lambs should be selected that have prolific mothers, for by so doing a natural tendency to prolificacy may be established and good feeding and management will make it evident. The milk-producing and lamb-raising abilities of the ewe can readily be told by the way in which the lambs grow. Use this evidence as a basis of culling and selection. Only lambs from ewes that are good wool producers should be retained in the flock.

(c) *Selecting a Well-bred Ram.*—When selecting rams emphasis needs to be placed upon securing a purebred, masculine, vigorous, well-made sheep. A good ram to use on 40 ewes kept for market-lamb production is worth from five to ten times as



Courtesy of University of Illinois

Fig. 30.—A Good Southdown Sire

In choosing a ram masculinity, vigor, fleshing qualities, and growthiness or size are important.

much as the average value of the ewes. Rams of medium size for the breed are generally the best sires. Weak, poorly formed rams, lacking vigor, cannot be expected to sire good, strong, rapid-growing lambs. It is generally advisable to buy a yearling or two-year-old ram. Well-grown ram lambs, especially of the

Hampshire breed, are often used. Tried sires may sometimes be obtained.

7. Buying Sheep.—Farm flocks are generally started in the fall just before the breeding season. However, many are started by purchasing bred ewes during the winter and some are begun through the purchase of ewes with young lambs in the spring. Each of these methods has advantages that will occur to the purchaser. If a considerable number of ewes is to be purchased, this is most readily done in the fall when the producers are reducing their flocks before the winter season.

Small lots of ewes may often be bought locally and if good healthy ewes can be found this is a good practice. If one is buying range ewes in large numbers, they may be bought direct from the grower. Range sheep men usually do not care to sell less than a single- or double-deck carload. Good lots of ewes, both native (farm-raised) and western-range sheep, can be bought on the central markets. Care needs to be taken in buying ewes on these markets, however, so that one does not get a lot of culls at a high price.

In buying on a central market it is advisable—unless one is thoroughly experienced—to have a reliable, competent commission man select the ewes and make the purchases. In placing an order with such a person it is essential to specify definitely the type, age, size, and other qualities sought and to state the price to be paid. Some opportunity for judgment on the part of the commission man should be permitted, however, as it is sometimes possible to secure a superior lot of ewes at a price only slightly above that asked for those of average quality.

In buying ewes on the market in the fall there is a possibility that some or all may have been bred before they were shipped.

Purchases of western feeding lambs or sheep are usually made on central markets, through dealers in various localities or direct from the producers in the range sections. Feeding lambs are now seldom handled in less than double-deck carload lots of about 300 head, although occasionally a single-deck load

is purchased. A double-deck load will usually make one double- and one single-deck load when fattened and ready for return to market.

If bought on the range or on western markets for feeding in the central states, lambs, in many cases, may be shipped for "feeding in transit." Most railroads allow ample time for

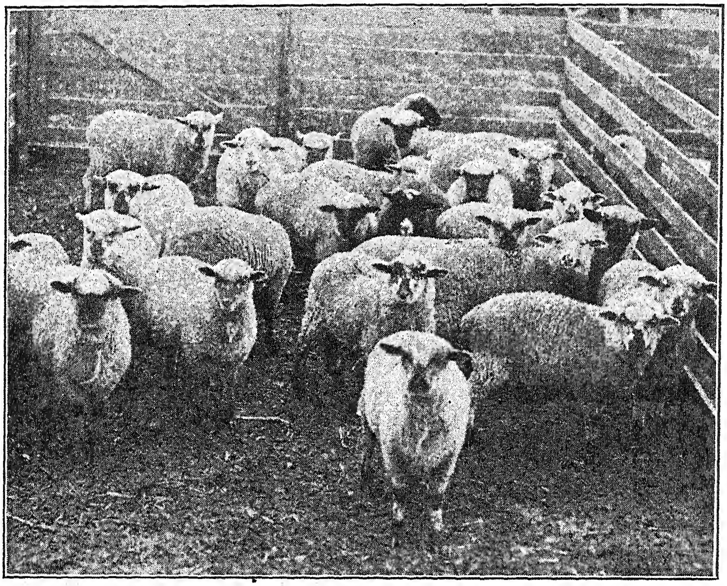


Photo by J. C. Allen *Courtesy of University of Illinois*

FIG. 31.—WESTERN FEEDER LAMBS

Many thousands of such lambs are purchased and fed each year and represent an important enterprise on numerous farms.

fattening the lambs at the feeding point or farm, and the finished lambs may then be marketed on the through bill of lading at a considerable saving in freight charges.

In many states health certificates must be secured from the authorized veterinary inspectors before the railroads will accept sheep or lambs for shipment unless they are consigned to central markets. Dipping of lambs and sheep is also required

if they are shipped from a market. This requirement is waived during winter.

8. Planning the Management.—Planning in advance the way in which one will handle his sheep is as necessary for the success of the enterprise as the purchasing of the sheep. If feeder lambs are bought, the farm crops must be planned so that suitable feeds will be available in sufficient quantities for fattening them. If field feeding is to be practiced, arrangements should be made for the use of some harvested feeds, and in sections of heavy rainfall suitable shelter will be advisable. If the lambs are to be fed in the dry lot, provision must be made for shelter as well as for pens and lots, feed racks, watering facilities, etc.

If one is handling a breeding flock, he must decide whether he will raise early or late lambs. The successful raising of early lambs requires careful study and planning to provide the necessary quarters, suitable feeds, and opportunity for growth. Although early lambs require more equipment than late lambs, they have several advantages. In most states early lambs—those dropped about February—are born during a period when many farmers have time to give them close attention. They may be marketed before summer at prices which are usually higher than those prevailing later in the year. Furthermore, they escape many of the hazards of parasitic infestations and of attacks by dogs.

The manager of a flock must also decide whether ewe lambs are to be kept and later added to the flock, or if all lambs raised are to be marketed and new lots of ewes purchased periodically.

If purebred sheep are to be raised even better planning and management will be necessary than for commercial lamb production, for in this case extra effort needs to be put into developing the young animals and in marketing them. Provision needs to be made for growing ram lambs and ewe lambs separately. Also, plans will need to be made for selling the animals individually or in small lots, usually in widely separated localities.

9. Studying Results.—No matter how carefully the sheep enterprise has been planned and organized, it is always possible to make improvements. It is the men who are alive to their business and are constantly making improvements without undue expense who are the prosperous ones. As a means of knowing where changes should be made, careful records should be kept. These need not be elaborate, but should be complete enough to show which ewes are most profitable, the chief items of expense, and the results secured from these expenditures. The return for each dollar invested in the sheep enterprise is a good basis on which to make plans for the future.

Furthermore, the keeping of records will show the number of lambs dropped, the number that die, and the causes of death. If records show the cause of the losses, then changes may be made in an effort to reduce them.

Purebred sheep raising necessitates the keeping of complete records of breeding and production. When there is added to these a record of the sales and prices it is possible to learn which ewes or families are most profitable. For example, it has been found that some individual ewes in the University of Illinois flock have, during a period of several years, raised lambs that have brought many hundred dollars. Other ewes handled in the same way have produced lambs only little more valuable than grade ewes might raise. Records which show such facts as these are very valuable.

COMMUNITY STUDIES

Many lessons of value may be learned by visiting farms on which sheep are raised. Studies regarding the organization of the sheep enterprise on various farms might involve such questions as the following:

1. How has sheep production been made a definite part of the farming system?
2. What were the reasons for establishing a farm flock? For engaging in lamb feeding?
3. How many lambs were raised? How many pounds of wool shorn?
4. What breed of sheep is kept? Why?
5. How large is the flock? What advantages has the owner found in a flock of this size?

6. What points do the various owners consider to be of most importance in selecting sheep?

7. What points are given consideration in buying sheep?

8. What experiences do the owners consider to be of value to them?

9. In what way are results studied?

10. Are there reasons why sheep raising or lamb feeding might be successful on these farms but not on yours?

11. Can you appraise the personal qualities of the men who are progressive sheep raisers or lamb feeders?

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NOTE. See also the references in Chapter I.

CHAPTER VI

ESTABLISHING AND ORGANIZING A SWINE ENTERPRISE

SWINE are used on many farms as the principal source of farm income. In such cases the entire cropping system is organized to meet the requirements of the enterprise. At the other extreme are the farms that raise only one or two hogs to make use of the kitchen waste and to contribute to the farm meat supply. While the conditions on practically all farms are suitable for swine production, there are a number of factors which should be given consideration in determinining the extent to which swine should be given a place in one's farming operations.

Management Problems:

1. Determining the possibilities of a swine enterprise.
2. Fitting the swine enterprise into the farm organization.
3. Adapting the size of the herd to the capacity of the farm.
4. Deciding upon a system of pork production.
5. Choosing a type and breed.
6. Selecting breeding stock.
7. Purchasing the breeding stock.

1. Determining the Possibilities of a Swine Enterprise.—Swine share with other livestock certain advantages discussed in Chapter I. In addition they have certain characteristics that make them better adapted to some conditions than to others.

Considerations:

(*a*) The capital investment for a swine enterprise is small.
(*b*) Swine are prolific, mature rapidly, and bring quick returns.

(*c*) Swine utilize grains and many waste products well.
(*d*) The salvage value of discarded breeding stock is high.
(*e*) Swine sell well at a wide range of weights.
(*f*) The swine enterprise is flexible.
(*g*) Swine require good fences and frequently do damage to the land.
(*h*) Swine are subject to heavy losses from disease and parasites.

(*a*) *The Capital Investment for a Swine Enterprise Is Small.*—The investment in both animals and equipment for swine is small compared with that required with other classes of livestock. A brood sow, for example, costing from $25 to $40, may, if properly cared for, produce more than a ton of pork for mar-

Courtesy of University of Illinois

FIG. 32.—A TON LITTER

Because swine are prolific and mature rapidly they bring quick returns on the investment. This litter of purebred Poland Chinas weighed over 2000 pounds when they were six months old.

ket in less than a year. Whole herds of sows have been known to average this high, though this is considerably above the production of sows on the average farm. One hundred and six Illinois farm records, involving 1760 sows, have shown a production of over 1300 pounds of pork for each sow and litter.

The cost of equipment per sow on many good swine farms is very low. In the study just mentioned, it was approximately $35 per sow. This represents an equipment investment of approximately $23 for each 1000 pounds of pork produced. Interest, depreciation, and upkeep on equipment amounted

to only 2.8 per cent of the cost of producing pork in this study.

(*b*) *Swine Are Prolific, Mature Rapidly, and Bring Quick Returns.*—Within seven to ten months after bred sows are purchased the money from the sale of their pigs can be in the bank. Even if the start is made with pigs at birth, only eighteen months need elapse before returns are realized from the sale of their offspring. The large number of offspring produced reduces the investment in breeding stock. As mentioned earlier, it is possible from one sow to produce from 1300 to over 2000 pounds of pork in a year. No other farm animal grows at so rapid a rate as the pig. He weighs at birth 2½ to 3 pounds and within a week or ten days may have doubled this weight. Even at an older age his gains in proportion to his weight are relatively more rapid than those of other animals.

(*c*) *Swine Utilize Grains and Many Waste Products Well.*—Because of their capacity to utilize concentrated feed, swine fit well into a system of farming that produces an abundance of grain. Swine can be used to recover grain that would otherwise be largely wasted, such as corn left in the fields at harvest time and even shattered small grains. Low-grade and damaged grains that have no market value can frequently be fed to hogs to as good advantage as can sound grain. The wide appetite of swine makes them useful as consumers of many waste materials on farms and elsewhere that would otherwise be lost.

(*d*) *The Salvage Value of Discarded Breeding Stock Is High.*—Brood sows after they have finished the useful period of their lives as breeding animals sell for a relatively good price on the market. This makes the carrying charge against them while in the herd very light. A study of livestock prices on the Chicago market during the four years 1927 to 1930 inclusive reveals an average price for "medium and good packing sows" (as such animals are classified) of $8.84 a hundred pounds, or 87 per cent of $10.14, which was the price of "good and choice" 200- to 220-pound hogs.

During this same period the price of "good and choice

cows " was 67 per cent of the price of " choice " 900- to 1000-pound steers, and the price of " medium to choice " ewes was less than 47 per cent of the price of fat lambs.

(*e*) *Swine Sell Well at a Wide Range of Weights.*—At times well-finished pigs as light as 150 pounds may " top the market " while at other times the market may pay top prices for hogs double that weight. Even on the same day the spread in price due to these extremes in weight may be less than fifty cents a hundred. This condition on the market permits of considerable deliberation in marketing one's crop of pigs.

(*f*) *The Swine Enterprise Is Flexible.*—Because swine are prolific and mature early it is easy to increase or decrease the size of the swine enterprise quickly in accordance with changing circumstances. While this is an advantage under many conditions, it is also the primary cause of the wide fluctuation in swine prices that occurs from year to year.

After the swine enterprise has found its place among the other enterprises of the farm, wide variations in the number of hogs raised from year to year are not usually desirable. Small changes in number based upon a careful study of market trends may frequently be made with profit, though even such changes are not without hazard.

(*g*) *Swine Require Good Fences and Frequently Do Damage to the Land.*—To control swine properly requires good fences. At the time the enterprise is undertaken provision should be made for suitable hog-tight pastures and lots. Frequently these can be provided more satisfactorily with temporary than with permament fencing.

Rooting is not a necessary function of the pig if he is given a suitable ration. In actual practice, however, one must expect some damage to the land from this cause. Suitable rings in the nose will largely control this trouble.

(*h*) *Swine Are Subject to Heavy Losses from Disease and Parasites.*—Whether from nature or from the method of handling, swine are subject to heavy losses from disease and parasites. These losses may come so suddenly and be so

large as to endanger the entire enterprise. All possible precautions should be taken to avoid them. Vaccination against hog cholera and careful sanitation accompanied by good feeding are the best means now known of coping with this situation.

2. Fitting the Swine Enterprise into the Farm Organization.—The swine enterprise must be in harmony with other farm enterprises. The relation that exists between the separate enterprises of the farm frequently influences the profits and the pleasure of farming.

Considerations:

(*a*) Planning for raising grains and choice forage.
(*b*) Considering the possibility of combining swine with other livestock production.
(*c*) Considering the use of swine for "hogging-down" crops.

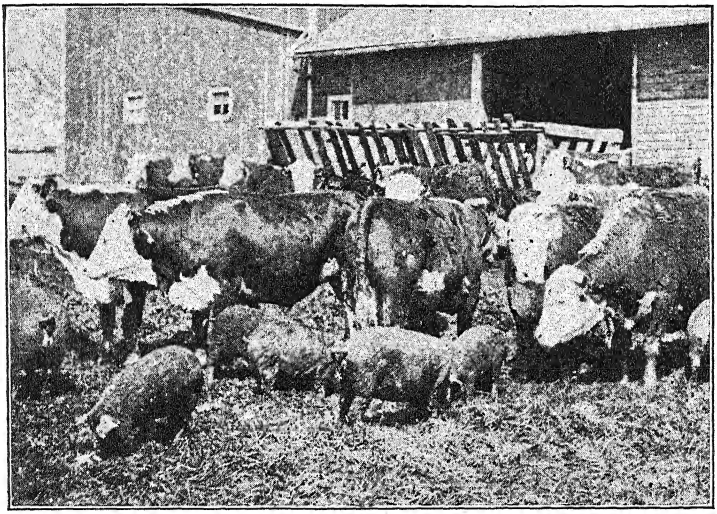
(*a*) *Planning for Raising Grains and Choice Forage.*—As noted previously, swine require an abundance of concentrates. A farm, therefore, on which the land is so badly broken that it produces a large amount of low-grade roughage and little grain would not be adapted to swine production. A crop rotation to be adapted to swine raising must produce an abundance of grain.

While swine, compared with other farm animals, use only a small amount of forage, no attempt should be made to develop a swine enterprise on a farm unless the cropping system can be made to produce sufficient good forage for them. Since their capacity to use this class of feeds is limited, the quality is doubly important. Of equal importance with the quality of forage is the necessity of supplying it under sanitary conditions. Pastures that are to be occupied by young pigs especially must not harbor the eggs of dangerous parasites (see page 355).

(*b*) *Considering the Possibility of Combining Swine with Other Livestock Production.*—Swine utilize dairy by-products especially well. On farms that do not sell market milk, therefore, hogs make an excellent supplement to a dairy enterprise.

This combination also supports a well-balanced cropping system.

Swine are considered a necessary part of a beef-cattle feeding enterprise because of their ability to recover and utilize the grain in the cattle droppings. Whether hogs to follow cattle should be raised or purchased as needed will depend upon a number of factors that should be studied carefully.



Courtesy of University of Illinois

FIG. 33.—HOGS FOLLOWING CATTLE

In addition to their ability to recover grain in cattle feed lots, as illustrated here, swine utilize to good advantage many products that would otherwise be wasted.

(c) *Considering the Use of Swine for "Hogging-down" Crops.*—The labor of harvesting certain crops, notably corn, can frequently be saved by "hogging them down." With small grains the practice is not recommended because of the waste involved. Whether it will pay even with corn will depend to a considerable extent upon weather conditions. During wet weather the waste of feed with this practice is frequently

excessive. In any event full advantage should be taken of the ability of hogs to recover the corn that is missed during harvest. This can, of course, be done best by brood sows or stock hogs with which rapid gain is not desired, since such a field does not contain enough feed to support rapid gain.

3. Adapting the Size of the Herd to the Capacity of the Farm.—Conditions on the individual farm are so important in determining the size of swine enterprise best adapted to a given farm that recommendations of any value can be made only after a study of the farm in question. Two points that may have a limiting influence on the number of hogs raised are the feed supply and the amount of labor and equipment that can be made available to the enterprise.

Procedure:

(*a*) Raise only the number for which feed is available.
(*b*) Limit the enterprise to the amount and quality of labor and equipment available.

(*a*) *Raise only the Number for Which Feed Is Available.*—In establishing a swine enterprise, it is advisable to begin with moderate numbers and develop as facilities and experience seem to warrant. As swine are kept primarily to provide a market for corn or other farm grains, the size of the enterprise should bear a close relation to the amount of feed to be thus marketed. It is not possible to give accurately the amount of feed required for a given swine enterprise because this depends upon so many factors. A recent study in Indiana shows that to maintain a herd of ten sows that produced 55 spring and 37 fall pigs, and feed the 92 head to an average weight of 200 pounds, required 1472 bushels of corn, or its equivalent, and 1850 pounds of tankage, or its equivalent, as supplement to the corn. This amounts approximately to three acres of 50-bushel corn for each sow and litter. Pasture requirements are even more difficult to estimate. It would require, however, possibly one-third to one-half acre of ground to provide suitable pasture for each sow and litter.

(*b*) *Limit the Enterprise to the Amount and Quality of Labor and Equipment Avaliable.*—The amount of labor required to raise hogs is small, amounting to from 5 to 7 per cent of the total cost of producing pork. During the farrowing season, the demand is rather exacting, but at other times it is no more so than with other livestock.

The Indiana study previously mentioned shows that the labor necessary to care for a herd of 10 sows and their 92 pigs (55 spring and 37 fall pigs) for a year amounted to a total of 40 days. Exactly half of this was required by the sows from the time they were bred until the pigs were weaned.

While the labor requirement for pork production is relatively small, it is so exacting at farrowing time as to be, under certain conditions, the factor that limits the size of the enterprise. On farms where most of the labor is supplied by a man and his family, with the hire of some additional day labor, the size of the enterprise seldom exceeds 20 sows. The addition of a permanent hand to the labor supply of the farm will permit of some increase in the size of the enterprise if other factors are favorable.

The amount and quality of equipment vary widely from farm to farm. One of the important factors governing the equipment needs is the time chosen for the farrowing of spring pigs. February- and March-farrowed pigs require more and better equipment than pigs that are farrowed later. Somewhat more pork can be produced with given equipment under a two-litter system than under a one-litter plan.

The actual average investment in swine equipment on 106 farms was found, in an Illinois study, to total $595, or approximately $35 per sow in the breeding herd.

4. Deciding upon a System of Pork Production.—The importance of swine to the farm organization as a whole and to the income of the farm will suggest the system of swine production that can most advantageously be followed on a given farm.

Considerations:

(*a*) Choosing between gilts and sows.
(*b*) Choosing between the one-litter and the two-litter system.

(*a*) *Choosing between Gilts and Sows.*—Mature sows farrow and raise larger litters than gilts do, which is an important factor in the cost of production. Because of the larger size of the sow and her maturity, however, she requires more feed for maintenance than the gilt, and increases less in weight during the time she is producing her litter. Practical pork producers evidently attach considerable importance to this factor, since they seldom use mature sows when they desire but one litter of pigs a year. In purebred herds sows may be required to raise only one litter a year, especially if they are exhibited at fairs. On the market, gilts that have produced a single litter sell for a higher price than mature sows, owing to their smaller size and smoother bellies.

These various factors apparently balance each other rather closely, since studies of the cost of producing pork indicate that the make-up of the breeding herd—whether largely of gilts or of older sows—has little if any effect on the final cost.

Unless one is following the one-litter system, it is considered good practice to keep a sow in the herd as long as she continues to be a good mother and raises a large litter of satisfactory pigs.

(*b*) *Choosing between the One-litter and the Two-litter System.*—In the one-litter system as usually practiced only spring pigs are raised and these by gilts which are fattened for market as soon as the pigs are weaned. In the two-litter system both spring and fall pigs are raised. Gilts are introduced into a two-litter herd only as they are needed to replace sows that are discarded. They produce their first litter when they are a year old, their second at two years of age, and produce two litters a year thereafter as long as they continue to breed regularly.

Under the two-litter plan the spring pigs must be farrowed fairly early except in the South, in order to get the fall pigs

started before cold weather sets in. March 1 and September 1 are the dates usually aimed at. There is, of course, nothing to prevent following the two-litter system with a gilt herd. In such a plan spring gilts would be used to produce the spring pigs and fall gilts the fall pigs. All gilts would farrow when a year old and would be fattened for market after their pigs are weaned. This method permits choosing both farrowing dates to suit one's convenience.

Fuller use is made of equipment and a larger volume of business is possible with given equipment with the two-litter system than with the one. From studies that have been made, however, there seems to be little difference in the profits to be derived from the two systems.

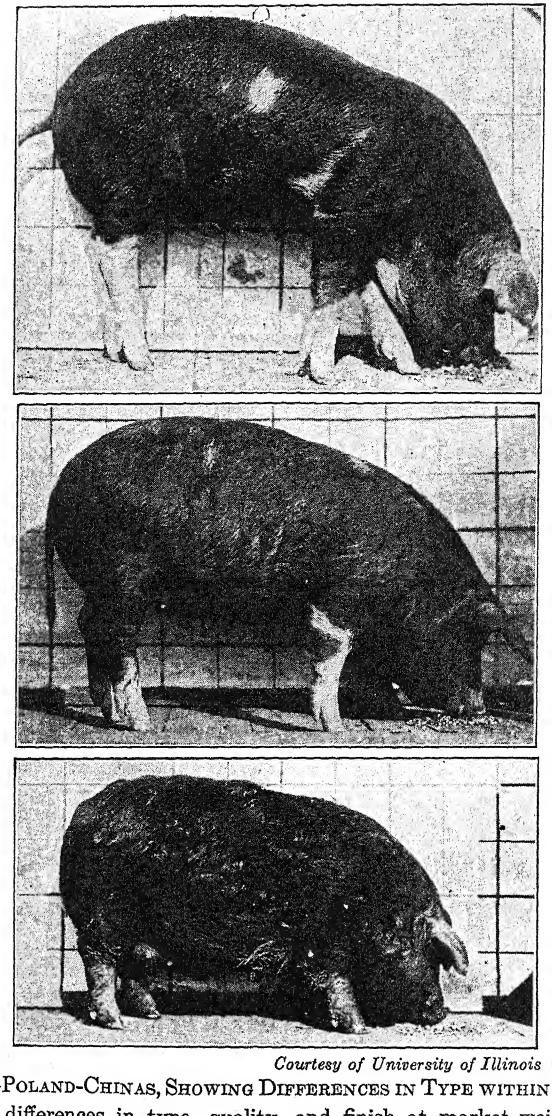
When even more intensive production is desired, a three-crop plan can be followed in which March, June, and September pigs are produced. March gilts are used to produce pigs in June after they are a year old. They are then bred to farrow the following March and again in September.

5. Choosing a Type and Breed.—There are numerous breeds of swine from which to choose. Since they differ little in their utility under practical conditions, personal preference may largely dictate the breed chosen. The advantage of selecting a breed that is popular in the neighborhood has already been pointed out. Purebred sows are not essential to successful pork production, but for the advantages discussed in Chapter XX the boars used should always be of registered parentage.

Considerations:

(*a*) Choosing between bacon and lard types.
(*b*) Studying the various breeds.

(*a*) *Choosing between Bacon and Lard Types.*—On the basis of type, hogs may be divided into two groups: lard type and bacon type. Lard-type hogs differ from those of the bacon type in being somewhat wider, deeper, and shorter of body in proportion to size. As the name implies, they carry relatively more fat than bacon hogs do. This is shown both in the



Courtesy of University of Illinois

FIG. 34.—POLAND-CHINAS, SHOWING DIFFERENCES IN TYPE WITHIN A BREED

Wide differences in type, quality, and finish at market weight exist in most breeds of swine. These Poland Chinas are shown at a weight of 225 pounds. There was no difference in their rate or economy of gain, but there was a great difference in finish. At the present time pigs of the intermediate type meet the requirements of the American market better than those of either extreme.

accumulation of fat surrounding the internal organs and in the thicker covering of fat over the back and ribs.

In economy of production there seems to be no appreciable difference between the two types. The available feed and the markets of the United States have been such as to favor the development of lard-type hogs. Bacon-type hogs are relatively more numerous in Canada.

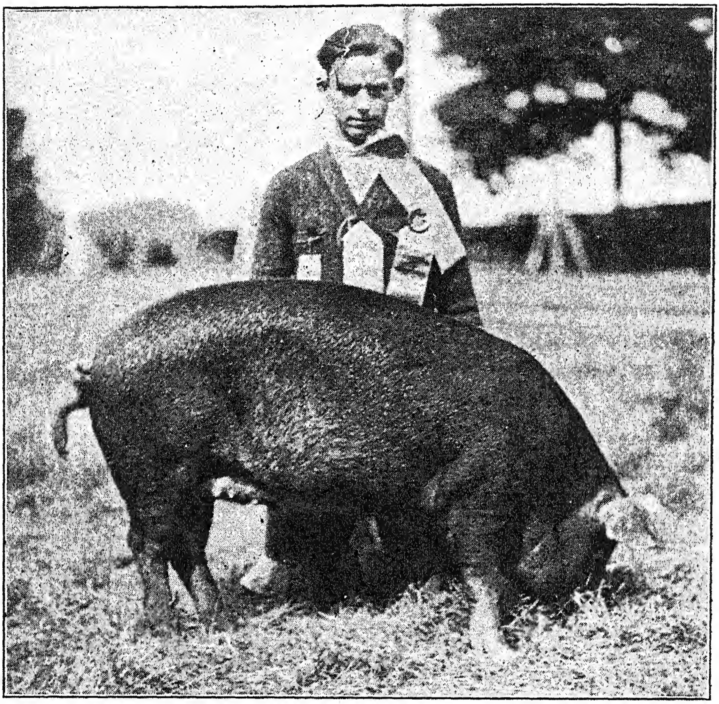
In recent years the price of lard has been so low as to encourage producers to market hogs at a lighter weight. There has also been a material change in the approved type of lard hogs, tending toward the bacon type. A development that is equally characteristic and fully as important is a very marked improvement in the quality and smoothness of the animals. The rate and economy of gains made by swine apparently are not affected by breed or type differences, so far as experimental work has shown to date. Extremely rangy lard-type pigs, however, frequently do not finish well enough at a live weight of 200 to 225 pounds to produce a satisfactory carcass. Such carcasses lack firmness and are too thin in the belly region to yield a bacon cut of choice quality. At times even the covering over the back and hams is too thin for a high-grade carcass.

Breed differences within the same type are confined to differences in color, set of ears, and features about the head. These points are not commercially important except as breed characteristics. The individuality and the inheritance of an animal are of practical utility and should be considered in selecting breeding stock.

(*b*) *Studying the Various Breeds.*—Lard type in swine is a product of American agriculture. The best known breeds of this type are the Berkshire, Chester White, Duroc-Jersey, Hampshire, Poland China, and Spotted Poland China. With the exception of the Berkshire, these breeds all originated in this country. Under favorable conditions any of them will prove satisfactory on the average farm. Only two breeds of bacon hogs are at all common in the United States and these

have an extremely limited distribution. They are the Yorkshire and the Tamworth.

The *Berkshire* breed originated in England. The first recorded importation of Berkshires to America took place in



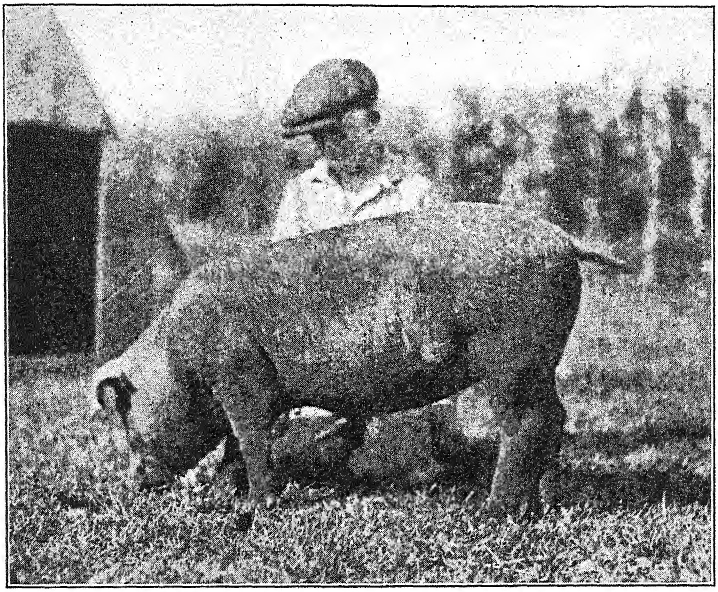
Courtesy of University of Illinois

Fig. 35.—A Good Pig-club Gilt

The gilt shown here and the one shown in Fig. 36 were both raised in club projects. It is easy to see why this boy has all the ribbons. His gilt excels the other in type, conformation, constitution, quality, and udder development.

1823. The breed is distinguished by its black color with white markings, known as "six white points,"—usually on the face, feet, and tail,—its erect ears, dished face, and head character.

The *Chester White* is one of the earliest breeds to be developed in the United States. It is in reality an amalgamation of three distinct strains of white hogs, one of which was developed in Pennsylvania and the other two in Ohio. The distinguishing



Courtesy of University of Illinois

FIG. 36.—A POOR PIG-CLUB GILT

This boy was handicapped in his project the day he started because his gilt lacked the type, quality, conformation, and udder development necessary in a good brood sow.

breed characteristics are an unbroken white color and drooping ears.

The *Duroc-Jersey* breed originated in New York and New Jersey during the early settlement of the country, supposedly from importations of red hogs from Spain, Portugal, and Africa. The breed as it is known today has been developed since 1885. Its distinguishing characteristics are its red color and drooping ears.

The *Hampshire* breed is of modern origin. Its official birth occurred in Kentucky in 1893 under the name of Thin Rind. The present name was adopted in 1904. The breed is black with a white belt. The belt varies considerably in width, but it must completely encircle the body and usually it includes both front legs. The ears are erect and the snout rather long and straight.

The *Poland China* breed is a product of southwestern Ohio, tracing its lineage back to the early settlement of that state. The claim is made that no outside blood has been used in the breed since 1845. Considerable white color, approaching actual black-and-white spotting, was permitted in the breed until fairly recent times. These animals are recognized by their black color, "six white points" as in the Berkshire, and drooping ears. Some white on the body is not unusual.

The *Spotted Poland China* breed developed practically from the spotted herds of early Poland China history. The breed association was not formed until 1914. The distinguishing marks of the breed are its black-and-white spotted color and its drooping ears.

6. Selecting Breeding Stock.—Since breeding stock pass their qualities on to following generations, in some cases to large numbers of animals, it is important that they be as free as possible from undesirable weaknesses or defects. Animals selected for the breeding herd should show the characteristics of the breed they represent, should be of desirable type and quality, and give promise of being productive.

Procedure:

(*a*) Choosing gilts that promise to be productive.
(*b*) Selecting the boar to improve the herd.

(*a*) *Choosing Gilts that Promise to Be Productive.*—Gilts for the breeding herd should be selected on their promise of producing and raising large litters of desirable pigs. In the brood sow length of body is of special value as it gives her the roominess needed for the development of her litters. Long-bodied

sows usually have a larger number of teats and more udder space than short-bodied sows, which is an advantage in raising large litters of pigs. Strength of back, smoothness, and general quality are also characters to be sought for in breeding stock. A strong constitution, sound feet and legs, a feminine appearance, and a sound udder are also important.

(*b*) *Selecting the Boar to Improve the Herd.*—The old saying that the boar is half the herd is a good slogan to keep in mind. His influence extends to all the pigs while a sow affects only her litter. Because of this greater use to which the boar is put he should be selected even more rigidly than the sows, for the uniformity, quality, and usefulness of the herd are largely dependent upon him. The type, quality, soundness, and other characters that are desirable in the sows should be insisted upon in the boar. His final test is, of course, the quality of his offspring. If these are satisfactory he should be retained; if not, he should be replaced by a better prospect. See Chapter XX.

7. Purchasing the Breeding Stock.—There are two general methods by which breeding animals may be purchased: by private treaty and by public auction. When it is desired to purchase several animals private treaty will usually involve more travel and take longer time. As a compensation, however, it affords ample opportunity to study the animals and the families from which they come. For a young breeder the privilege of close contact with those of wider experience that is afforded by the private sale should prove both stimulating and helpful. The price at such a sale is naturally set by the seller, while at an auction the buyer sets the price.

The introduction of disease into one's herd with purchased animals should be carefully guarded against. A period of quarantine for all animals that are brought into the herd is an excellent additional precaution which should always be taken.

FARM STUDY

Study the organization of the swine enterprise on your own farm with a view to determining what changes in organization you think could be made that would increase the net income from the enterprise.

1. What changes if any would you suggest in the cropping system to make it more favorable to the enterprise? What would be the probable effect of these changes on the returns from the other enterprises?

2. In what manner might swine be employed more effectively than now with other livestock and crop enterprises?

3. What if any change might be made in the size of the swine enterprise in the interest of higher income? In the amount or quality of the equipment used?

4. At what point does labor come to be a limiting factor to the enterprise? How might this be overcome?

5. What if any change in the system of production might be made with advantage to the enterprise—change in the age of the breeding animals or in the number of litters produced in a year?

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NOTE. See also the references in Chapter I.

PART II.—FEEDING

CHAPTER VII

PRINCIPLES OF LIVESTOCK FEEDING

THE way in which farm animals are fed is one of the most important factors affecting their usefulness and productivity. If poorly fed they are seldom profitable, while if fed according to the best practices known they will as a rule bring good returns.

THE DIGESTION OF FEEDS

Feeds must undergo extensive physical and chemical changes before they can be utilized by the animal. It is only after the compounds of the feed have gone into solution that they can pass out of the digestive tract and enter the blood stream.

The stomachs of cattle, sheep, and goats are divided into several compartments. These are known as the rumen, or paunch, the reticulum, the omasum, or manyplies, and the abomasum.

The rumen occupies most of the left half of the abdominal cavity. When the animal is standing quietly or lying down, it sends back, through muscular contractions, small portions of the feed from the rumen to the mouth for rechewing. This rechewing is called rumination, or chewing the cud. For this reason animals which chew their cud are termed ruminants. The rumen, through the movements of its strong muscular walls, mixes the feed thoroughly with the water and saliva present and thus softens it. Bacteria which are present in large numbers on the feeds eaten bring about fermentation processes.

These aid in the digestion of the fiber, which results in the production of simple sugars, acids, and large amounts of gas. The bacteria, through their growth, also produce one or more vitamins which are useful to the animal.

When the feed is divided finely enough through rechewing, softening, and fermentation, it passes gradually in small portions at a time from the rumen to the reticulum. This division of the stomch seems to take no direct part in digestion. Foreign material such as nails, wire, stones, or glass, which are sometimes swallowed with the feed, are apt to lodge here, and as this part of the stomach is very close to the heart, it occasionally happens that the stomach wall and heart are punctured with fatal results.

In the omasum many layers of muscular leaves reduce the feed to fine particles. Whole grains, beans, and weed seeds, however, may resist this action and pass through the entire digestive tract unbroken.

The abomasum secretes the gastric juice, which acts on the proteins of the feed, converting them to simpler chemical compounds.

Horses and swine do not ruminate. Their stomachs have but one compartment and are not nearly so large proportionately as those of cattle and sheep. The horse, however, can digest large amounts of hay and other fibrous feeds because of the fact that fermentation and the greater part of the digestion processes take place in the first part of the large intestine, which is greatly enlarged. The pig has a relatively small stomach and can digest but little fiber. Since this is true, the feed given swine must be largely grains and other concentrates. The digestion processes which take place in the stomachs of horses and swine are similar to those which occur in the fourth compartment of the ruminant's stomach.

Most of the true digestion processes take place in the small intestine and not in the stomach, as commonly believed. Here in the intestine a large number of enzymes, secreted by the pancreas and the walls of the intestine itself, together with bile

from the liver, act on the compounds passed on from the stomach. These are reduced to simple chemical substances which are soluble in the water and digestive juices present.

These simple substances are taken into the blood stream by absorption through the walls of the cells which form the lining of the small intestine.

The fibrous parts of feeds, such as coarse stalks of corn stover, stems of hay, corn cobs, and straw, resist the action of digestive juices so that they do not go into solution and cannot be absorbed through the intestinal wall. Some of the protein which is a part of the fibrous plant cells is also very resistant to digestive action.

Digestive action continues to some extent in the large intestine, although no enzymes are secreted here. Bacterial action also continues and the products of digestion and water are absorbed through the intestinal walls into the blood as in the small intestine. The undigested feed residues, together with mineral salts, and immense numbers of bacteria, comprise the feces, or dung.

The products absorbed from the intestines are carried in the blood stream to every cell and are taken up as needed by the different tissues and organs.

FEEDS CONTAIN MANY COMPOUNDS

The compounds of feeds as determined by chemical analyses are grouped into several classes.

Dry matter includes all the compounds in feeds except the water. Green grass, silage, and roots contain not more than 10 to 40 per cent dry matter, the remaining 60 to 90 per cent being water. Hays and grains after several months' storage may still contain as much as 10 to 15 per cent of water. In growing plants the water content varies greatly. When the plant is young and tender the content is very high, usually 90 per cent or more, but as it develops the proportion of water becomes less, and when approching maturity, the proportion declines rapidly. For these reasons it is important in making

a comparison of the value of feeds to know the percentage of dry matter they contain or how much allowance to make for water content.

The chemist determines dry matter in a feed by drying a weighed sample in an oven at a temperature about that of boiling water until the sample loses no more weight.

Protein is a term applied to all the substances in feeds which contain nitrogen. The term crude protein or total protein is sometimes used, but in this book the simple term protein has been adopted.

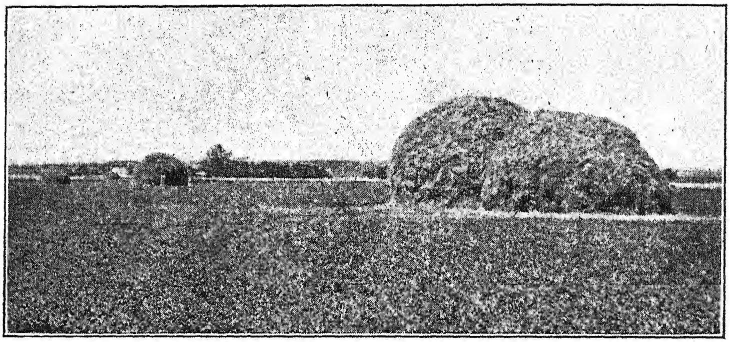

FIG. 37.—ALFALFA IN THE PLATTE RIVER VALLEY

This valley is the leading section of the United States in the production of alfalfa for market. It is literally dotted with these rounded stacks, each of which contains enough for a carload of baled hay. Some of this hay is shipped as far as the New England states for the feeding of dairy cattle. One of the chief values of alfalfa hay, in common with other legume hays, is its high protein content.

The protein, or nitrogenous, products are of the first importance, for without them growth would be impossible. The muscles, glands, hair, wool, hoofs, horns, and hide, although they contain fat, minerals, and water, are primarily protein tissues; hence protein is essential for the building up of these tissues in growing animals and for their continuous replacement as they break down in what is termed wear and tear and are excreted in the urine. Protein is also essential for animals

giving milk, since milk has a large protein content, and for animals bearing young for the development of the fetus.

Whenever an insufficient amount of protein is furnished in the feed, the body protein is drawn upon for certain purposes, such as the growth of the fetus or the production of milk. If this is continued for some time, the animal becomes thin, for no other constituent of the feed can take the place of protein. If more than enough protein is supplied in the feed, the surplus is broken down chemically and the nitrogenous products which result are excreted in the urine. The nutrient portion which is left may be used to form body fat or for energy purposes in the same way as the fats and starchy feeds are used; feeds which would supply these needs at far less cost than protein feeds. Feeding either too little or too much protein, therefore, is both harmful and uneconomical if the deficiency or the surplus is extreme.

Some feeds contain much more protein than others. Those very high in protein content, such as cottonseed meal, soybean oil meal, linseed meal, tankage, etc. (see Table 7), are termed high-protein feeds. They are also spoken of as protein supplements, since they are combined with feeds low in protein in order to raise the percentage of protein in the ration to the desired level; that is, they supplement the low-protein feeds, increasing the economy of the ration.

Protein is the only group of compounds of feeds which contains nitrogen. In determining the amount of protein in a feed, therefore, the chemist determines the amount of nitrogen and from this value calculates the amount of protein.

Mineral matter includes those substances which are left as ash when the feed is burned. Often it is termed *ash*; it is also spoken of as *mineral salts*, or minerals.

Minerals are essential in the growth of the skeleton. They yield no energy but they are present in all the parts of the body and are very necessary in nearly every body process. Digestion, contraction of the muscles, breathing, and coagulation of the blood are only a few of the many functions dependent upon the

presence of minerals. If there are not enough minerals in the feed the supply in the skeleton may be drawn upon, gradually reducing the efficiency of the animal and finally undermining its health.

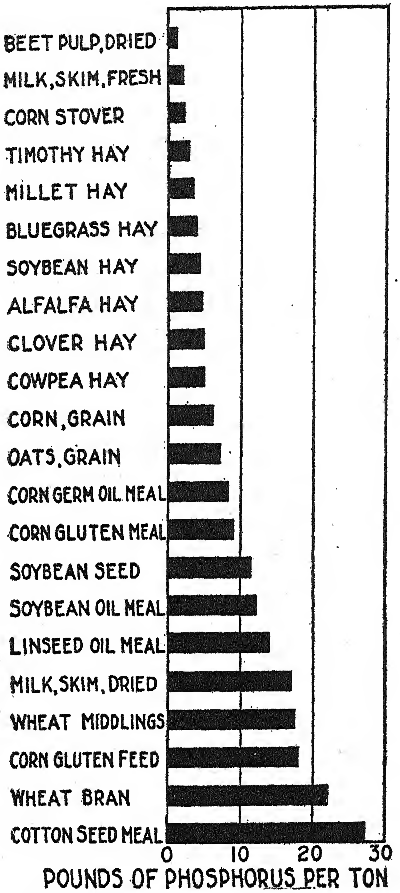

FIG. 38.—HIGH-PROTEIN FEEDS ARE THE BEST SOURCES OF PHOSPHORUS FOR LIVESTOCK

Seldom are livestock rations containing adequate amounts of high-protein feeds deficient in phosphorus.

Common salt is entirely mineral matter and bone meal is almost entirely so. Tankage has a very high content of minerals. The hays and other roughages are much higher than the farm grains in mineral matter. The elements comprising the mineral matter vary greatly in different feeds. For example, the mineral matter of legume hays and skim milk has such a high proportion of calcium that these feeds are especially recommended for animals needing large amounts of lime, such as cows in milk and young pigs and calves. In the same way the mineral matter of the feeds classed as protein supplements is especially rich in phosphorus.

Fiber, or crude fiber as it is usually written, is the fibrous or woody portion of the plant known chemically as

cellulose. Corn stover, corn cobs, hays, straws, oathulls, and the like are high in fiber, while the farm grains and seeds are relatively low.

The chemist determines the fiber content of a feed sample by treating it alternately with weak acids and alkali solutions, and following with a final washing with alcohol and ether. These treatments remove all the compounds except the fiber and some of the mineral matter. The residue is dried and after a correction is made for the mineral matter present, its weight represents the amount of fiber present.

The *fat* of feeds includes what are commonly recognized as fats and oils. They are obtained chemically by treating a sample of feed with warm ether. The term ether extract is more exact for this class of substances because the ether dissolves not only the fat but also the green coloring matter, waxes, and similar substances. The ether extract of seeds such as soybeans and peanuts is chiefly oil (fat), while that of green hays contains these other substances as well.

Farm grains and most roughages have but small amounts of fat, while seeds such as soybeans, flaxseed, cottonseed, peanuts, etc., are very high in this constituent. The oil in these seeds is usually more valuable as human food, as a constituent in paints, etc., than as feed for livestock, so it is pressed or dissolved out. The remaining product is known as oil cake or oil meal, depending upon the degree of fineness of the product, such as linseed oil cake or linseed oil meal. The term oil in the name of the feed is often omitted and it is called simply linseed cake or meal.

Nitrogen-free extract refers to the portion of the feed which is starchy in nature. In farm grains the nitrogen-free extract is common starch as we ordinarily know it; for example, corn starch. In roughages it consists almost entirely of more complex starches known as galactans, levulans, etc. The nitrogen-free extract and the fiber are commonly called the carbohydrate portion, or carbohydrates, of the feed.

Since there is no satisfactory method of determining nitrogen-

free extract of a feed directly, it is calculated by subtraction after the other compounds have been determined. The sum of the percentages of water, protein, ash, fiber, and fat subtracted from 100 gives the percentage of nitrogen-free extract.

The digestion products of starches, sugars, fiber, and fats furnish energy for carrying on the body processes. They also furnish the sugar and fat of the milk. If a surplus over the daily body needs is given, it is stored as body fat.

Vitamins are present in most feeds in extremely small quantities. Formerly, the relative amounts of vitamins in feeds were found by means of feeding experiments with small animals but direct chemical tests for several of the vitamins are now in use.

Vitamins promote growth and help to regulate many of the body processes, thus preventing diseased conditions.

Pigments, or coloring matters, are also present in feeds and may perform useful functions in the body in addition to furnishing color to the butterfat. In reporting the chemical composition of feeds the quantities of vitamins and pigments are disregarded.

Flavoring materials and *odors* of feeds which are naturally present as a result of plant growth are exceedingly important although they are often present in such small amounts that they cannot be estimated satisfactorily by chemical tests. The natural fragrance of newly made hay is an example of compounds in feeds which increase palatability and feed consumption.

Total digestible nutrients is a convenient term used in describing the total nutritive value of a feed for energy purposes. It is computed by multiplying the amount of digestible fat in the feed by 2.25 and adding to this amount the amounts of digestible protein, digestible fiber, and digestible nitrogen-free extract. (A pound of fat yields 2.25 times as much energy as a pound of starch, hence the use of the factor 2.25 in making the calculation.) The feed requirements of most animals may be calculated readily by the use of digestible protein and total

digestible nutrient values of feeds. This is simpler than making the computation in terms of digestible protein, digestible carbohydrates, and digestible fat and is fully as accurate.

The *nutritive ratio* is an expression used, less commonly now than formerly, as an index of the proportions of the digestible protein and non-protein nutrients of a single feed or of a ration. The digestible protein is represented as 1 and is used as the first term of the ratio. The second term is calculated thus:

$$\frac{\text{Digestible carbohydrates} + (\text{digestible fat} \times 2.25)}{\text{Digestible protein}}$$

The nutritive ratio of shelled corn is 1 : 10.4, which means that for every pound of digestible protein in corn there are 10.4 pounds of digestible carbohydrates and digestible fat calculated to a basis of carbohydrate equivalent.

THE COMPOSITION OF FEEDS VARIES

The composition and feeding value of different lots of the same kind of feed may vary greatly. For example, the protein content of alfalfa hay is generally given as about 15 per cent, but in different lots of hay it may vary from 12 to 18 per cent. One of the important factors affecting the nutritive qualities of a feed is the water content, as already pointed out. Whenever this is very high, as in mangels, green corn, and green alfalfa, the other constituents must of course be low. Alfalfa hay when put in the stack may have a water content as high as 20 to 25 per cent, but after thoroughly drying, the content may be as low as 12 per cent. As the proportion of water becomes less, the proportion of protein of course becomes larger.

The proportion of leaves present in clover and soybean hay, as well as in alfalfa, have a marked effect on the protein content, because the leaves are approximately twice as high in protein as the stems. Then, too, the leaves are low in fiber and the stems high in this constituent. The proportion of protein

and of minerals in hay is also reduced by leaching following rains.

Soil conditions, temperature, and amount of rainfall all affect the composition of crops. Thus wheat or corn grown in one part of the country may not be the same in feeding value as that grown in another part where the climate and soil are different. The variety of a grain also affects the composition.

The mill by-products differ in composition, depending upon the quality of the raw product and the way in which it is milled. For example, as soybeans differ in protein and oil content, depending on variety and season, the meal made from them will also differ in composition. As a rule, manufacturers analyze a sample of meal from each carload before shipment, so that they can give an accurate guarantee of composition. Wheat bran containing a high proportion of screenings may contain only 14 per cent of protein, while pure bran usually has about 16 per cent.

Many other factors cause fluctuations in the composition of feeds. In calculating rations for livestock using the analyses given in Table 7 and similar tables, it must be kept in mind that these are average values and allowance must be made for known variations in the qualities of the feeds.

FEEDS ARE OF TWO PRINCIPAL CLASSES [1]

Feeds are roughly divided into two classes:

(1) *Roughages*, such as hay, straw, fodder, silage, grass, and roots. Feeds of this class are bulky. They contain much

[1] Other terms sometimes used in classifying feeds are *nitrogenous* and *carbonaceous*. A nitrogenous feed is one which contains a large amount of nitrogen, or protein. A carbonaceous feed, on the other hand, is one which contains a high proportion of carbohydrates. Neither of these terms is very satisfactory because all feeds contain both nitrogen (protein) and carbohydrates. Further, the digestible carbohydrate content of non-legume hays, which are sometimes spoken of as carbonaceous roughages, is only slightly greater than that of legume hays.

In this book, emphasis is placed on the terms high-protein and low-protein rather than nitrogenous and carbonaceous, although the expression "nitrogenous concentrate" has been retained to some extent.

fiber and indigestible matter. Roughages which have a large water content, as grass, roots, and silage, are known as succulent feeds.

(2) *Concentrates*, which include farm grains and the protein supplements, such as wheat middlings, corn gluten meal, cottonseed meal, etc. The feeds are heavy in proportion to their bulk. They usually contain a comparatively large percentage of digestible matter and a small proportion of fiber.

FEEDS DIFFER WIDELY IN THEIR CHARACTERISTICS

Feeds differ greatly not only in their composition, but in their effects on physical condition and their suitability for different kinds of animals.

Succulent feeds, such as fresh green legumes and grasses, green corn, silage, roots, and pumpkins, are very palatable and, when fed in moderate quantities, help to keep the animals in good physical condition. These feeds are relatively high in water, and while they may furnish sufficient nutrients for maintaining a breeding herd, it is seldom that they are sufficient for horses at hard work, fattening animals, or high-yielding dairy cows.

Silage is made from many crops, including corn, sorghum, kafir, milo, and others, but the acreage of corn used for this purpose exceeds the total of all other crops. The refuse from the canning of corn and peas also makes silage of fair feeding value. As a rule, the higher the proportion of grain and the more nearly mature the grain, the greater the feeding value per ton.

Legume hays, such as alfalfa, clover, soybean, and cowpea, are the most valuable dry roughages for livestock. In protein content especially, these hays are far superior to the non-legume hays such as timothy, redtop, prairie, millet, sudan grass, and bluegrass. In fact, the growing of legumes makes it possible to produce on the farm at low cost a large part of the protein necessary in balancing rations for cattle, sheep, and

horses and a small part of that needed by swine. The legumes are much richer in lime than non-legumes and, so far as is known at present, are the best sources of lime for mature farm animals. Well-cured legume hay is also a valuable source of vitamins. Legumes have a greater palatability than the non-legumes. As a rule they promote good bowel action and help to keep animals in good health and condition. Sweet clover cannot be recommended as a hay crop because when moldy this hay frequently causes disease.

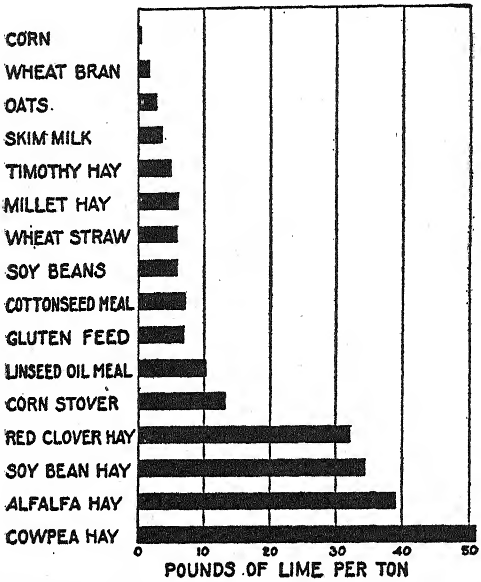

FIG. 39.—LEGUMES ARE THE BEST SOURCES OF LIME FOR CATTLE, SHEEP, AND HORSES

Legumes, either in well-cured hays or as pasture crops, furnish large amounts of lime in a form which is readily available to livestock. The legume hays are much richer sources of this mineral than other feeds commonly fed to cattle, sheep, and horses.

Non-legume hays are low in protein and lime and in most cases have a constipating effect when fed to cattle. Timothy and prairie hays are used extensively for horses. Millet hay containing a large amount of seed cannot be fed to horses with safety.

Corn fodder, *corn stover*, *sorghum*, *kafir*, and *milo maize* harvested at the proper stage and cured in well-made shocks are useful roughages for most classes of livestock. They should be fed freely, however, so that the animals are not forced to eat the coarse portions. These feeds have the same objections

as non-legume hays in being low in protein and lime and constipating in their effects.

Stalk fields furnish some forage for livestock. This term refers to cornfields from which the grain has been harvested from the standing stalks. In mild, dry seasons, this forage is of fair feeding value for a short time following maturity of the corn. Too often livestock is allowed the run of the field during extreme weather when exposure is bad for the animals and when most of the feeding value originally present has been secured by the livestock or lost through weathering.

The *cereal grain crops* may be used as emergency hay crops by harvesting during the late milk or early dough stage. These hays have, in general, the same characteristics as the other non-legume hays.

Straws from the threshing of oats, barley, wheat, soybeans, and cowpeas may be classed as low-value feeds. They are low in protein and mineral matter and high in fiber. The beards (awns) of wheat and barley make these straws objectionable as feeds, but good oat straw is useful as part of the roughage for idle horses, the beef breeding herd, and occasionally for dry dairy cows. For good results, straws must be supplemented with silage, legume hay, or other high-class roughage. If consumed in large quantity straws often cause digestive disturbances. One of the most serious of these troubles is impaction, or stoppage of the feed in its passage through the stomach and intestines. Animals allowed free access to straw piles with insufficient amounts of high-quality feeds have a rough appearance and lack the bloom characteristic of well-fed animals.

The *farm grains,* such as *corn, oats, barley, wheat, rye, milo,* and *kafir,* are the staple feeding crops throughout most parts of the United States. These grains form the major portion of rations for fattening animals, work horses, and milk cows. Compared with other feeds, they are very palatable and about neutral in their conditioning effects on the animal.

Corn is the grain used most commonly and in largest amounts for feeding. Its palatability to all classes of livestock, its ease

of preparation, and its high feeding value make it very popular. A most important consideration also is that in the region where it is grown extensively as a grain crop (commonly known as the corn belt) it usually furnishes nutrients more cheaply than any other concentrate. However, the particular grain to be used for feeding is usually determined by the kinds of crops grown on the farm and whether or not it would be cheaper for the farmer to sell the crop he has raised and buy a lower-priced grain for feeding, for he of course desires large returns per acre from his crops as well as the best returns from each animal. The acre yields of different corn-belt crops vary greatly in feeding value, as shown in Table 5. When the yields are in the relative proportions shown, corn and alfalfa stand highest, but occasionally some other crop grown, such as wheat, may be cheaper in feeding value than corn, and under some market conditions may be used instead of corn with a considerable saving.

Oats are grown on many farms, not only on account of the feeding value of the grain, but because they fit well in rotations and furnish excellent bedding for livestock. Oat straw is also used to some extent for feeding, as discussed above. Oats and barley grown in the northern states and in Canada are usually much plumper and higher in feeding value than they are when grown farther south. The northern-grown grains weigh more per bushel and have a smaller proportion of hull. If plump and well filled, barley may replace corn pound for pound in some rations, while oats are usually not more than 85 per cent as high in feeding value as an equal weight of corn.

Wheat, rye, milo, and kafir grains are similar in composition to corn, but most of them are slightly higher in protein.

Large quantities of *cane molasses*, a by-product of cane-sugar manufacture, are imported into this country for livestock feeding. A limited amount of molasses is also produced in this country as a by-product from sugar cane and some from sugar beets. This product is sometimes purchased in barrels or steel drums for farm use, but on account of the difficulty of

TABLE 5

FEED VALUE YIELDED PER ACRE BY VARIOUS CROPS

(Based on Estimated Yields and Average Analyses)

Crop	Yield	Digestible Matter Available as Feed	
		Digestible Protein	Total Digestible Nutrients
	Bushels or (Tons)	*Pounds*	*Pounds*
Barley: Grain	50.0	214	1,896
Straw *	(1.5)	......	......
Total	......	214	1,896
Corn: Grain, grade No. 3	50.0	196	2,240
Stover †	(2.0)	23	507
Total	......	219	2,747
Corn silage ‡	(10.0)	220	3,600
Oats: Grain	50.0	154	1,120
Straw *	(1.5)	30	900
Total	......	184	2,020
Soybeans: Seed	25.0	476	1,440
Straw *	(1.0)	8	480
Total	......	484	1,920
Hays: Alfalfa	(3.0)	624	3,060
Cowpea	(1.5)	330	1,230
Millet	(1.5)	159	1,740
Red clover	(1.5)	237	1,590
Redtop	(1.5)	138	1,590
Soybean	(1.5)	291	1,260
Timothy	(1.5)	93	1,470

* Barley straw, oat straw, and soybean straw furnish so little digestible matter that they are seldom used as feeds for cows in milk or for fattening cattle and sheep. For this reason the nutrients shown for oat straw and soybean straw should be disregarded when computing yields of crops for these animals. Swine, of course, make little use of dry roughages.

† The corn plant, when cut at the proper stage and well cured as stover, contains a large amount of digestible matter. Owing to the losses occasioned by weathering under the usual methods of handling the crop, and to the fact that livestock usually consume only the finer portions of the stover, the figures here given for digestible matter available as feed in the stover are not more than one-third of the original feeding value.

‡ When the entire corn plant is preserved as silage, there is some loss due to spoilage, though not so great a proportion of loss as when the corn is fed as grain and stover. These losses have been taken into consideration in estimating the yield of digestible nutrients available as feed. (Adapted from Ill. Agr. Exp. Sta. Cir. 272.)

mixing it with other feeds, little of it is bought in this way. It is used extensively, however, in commercially mixed feeds. The special values of molasses as a feed are that it increases palatability of mixtures, stimulates the appetite, and has a good effect upon the digestive system.

Dried beet pulp is a dry, bulky product which after soaking in water for a few hours increases in bulk and becomes a soft, succulent feed greatly relished by cattle. It is often used in this way in dairy feeding as a substitute for silage, although it is also used dry as an ingredient of grain mixtures. Frequently the manufacturer sprays the beet pulp with molasses. The dried product is then known as dried molasses beet pulp.

The *protein supplements* include by-products from the milling of farm grains and from the oil-extraction, packing-house, and other industries. They are used in rations in order to increase the protein content above that of the farm grains. By-products from the milling of wheat, such as *wheat bran, wheat middlings,* and *red dog flour,* are medium high in protein. Wheat bran is one of the best of all feeds for cattle and sheep. It increases the palatability of mixtures and, because of its laxative effects, tends to offset, in great measure, the undesirable effects of constipating feeds. Wheat middlings, known also as *shorts,* is a valuable feed for swine and where price permits can be used to advantage for nearly all livestock.

Corn germ meal, corn gluten feed, and *corn gluten meal* are by-products of the manufacture of corn starch. The first two are medium high in protein while the corn gluten meal is very high. These feeds are about medium in palatability and have no undesirable effects. They are high in energy and especially valuable in rations containing little or no corn.

Soybean seed is being used extensively in cattle rations. It is most palatable to steers, sheep, and swine when fed unground, but for dairy cows best results are secured when it is ground and used as part of a mixture. It induces a laxative condition and is about equal to linseed-oil meal in feed value. Both the seed and the *soybean oil cake* or *meal,* the product left after

removal of the oil from the seed, are classed as high-protein supplements containing from 30 to 40 per cent protein. The meal is more palatable than the seed, partly because of the slightly roasted flavor brought about by the heating during the extraction of the oil. The oil meal retains some of the desirable laxative properties of the seed.

Linseed meal is a high-protein product left after removal of the oil from flaxseed. This feed and wheat bran are the two

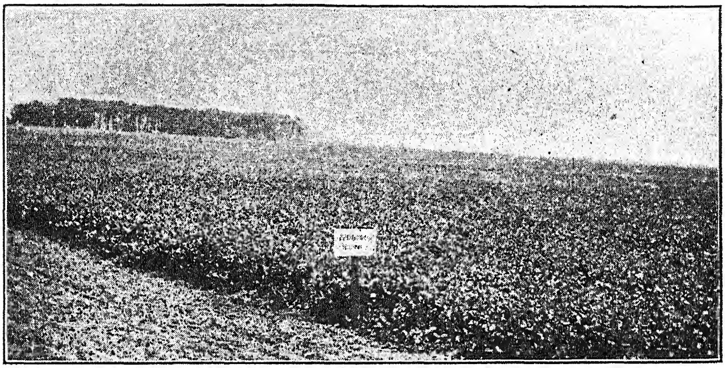

FIG. 40.—GROWING SOYBEANS FOR SEED

Clean cultivation has been practiced so systematically on this farm that one man pulled all the large weeds in this 220-acre field in one day. In some sections, particularly central Illinois, soybean seed is usually one of the most economical protein supplements for dairy cattle.

feeds par excellence for keeping livestock in good condition. Because of the demand, they are usually somewhat more expensive sources of protein than other feeds, but many farmers, nevertheless, are willing to pay a premium to secure them.

Cottonseed meal is the protein feed available in largest amount and is usually the most economical source of protein. Three grades, having different percentages of protein, namely, 36, 41, and 43 per cent, are commonly used. It is generally believed that cottonseed meal is constipating to cattle, but the results of experiments have not fully proved this point. Fed in large

amounts, it may induce a laxative condition. This feed tends to increase the hardness of the body fat of fattening animals and of the butterfat of milk.

Cottonseed meal is used extensively for beef cattle, dairy cattle, and sheep, but it cannot safely be fed to swine as a large proportion of the ration. When fed liberally, it may prove harmful to young calves and pigs.

In feeding cottonseed meal to dairy cattle the best results are obtained when an equal weight of linseed meal or wheat bran is combined with it. In all cases the meal should be supplemented with some good-quality roughage. When fed in open feed bunks or on the range, both linseed and cottonseed feeds are usually given in the form of cake broken in small pieces instead of the meal.

Tankage, blood meal, and *fish meal* are packing-house by-products very high in protein. Tankage contains 40 to 60 per cent protein, blood meal 60 to 80 per cent, and fish meal about 50 per cent. Though occasionally fed to other classes of livestock, tankage and fish meal are used principally for swine because they make very excellent supplements to corn. Blood meal is used mainly for young calves and to a lesser extent for pigs.

Ready-mixed protein supplements consisting of mixtures of several feeds are on the market. These are standardized usually to certain protein contents, such as 24, 32, or 34 per cent of protein.

Many other protein supplements may be had, but most of them are less available than those already mentioned. The *by-products from the milling of rye and buckwheat* are similar to the corresponding wheat feeds. *Peanut oil meal* from shelled peanuts is a very high protein feed having good qualities. *Copra meal,* or *coconut meal,* is an imported feed medium high in percentage of protein. When made from copra cake which has not molded in shipment and is otherwise in good condition, it is a good source of protein. *Distillers'* and *brewers' grains* are usually very bulky and about medium in palatability.

Most of them go directly into mixed feeds and are not available on the open market. *Screenings*, which consist of weed seeds, broken and shriveled grains, and broken stems screened from wheat, rye, and flax in the milling processes, are sometimes used as feeds. These have considerable feeding value, containing from 10 to 20 per cent of protein and having a fairly high energy value. They are not to be considered equal to the grains and their by-products, for at times the weed seeds they contain may have harmful effects on livestock. Screenings should be finely ground to prevent germination of the weed seeds. In many cases it is common practice to combine the screenings separated from the grains with one of the by-products. For example, "wheat bran with mill-run screenings" means that the screenings are combined with the bran in the proportion in which they occurred in the wheat from which the bran was made.

GRINDING FEEDS MAY MAKE A SAVING

Several points must be considered in deciding whether or not it is desirable to grind or process feeds. Unground grain is not as completely digested by livestock as ground grain. When fed whole, particularly if it is a small hard grain, some of the kernels are not broken in chewing and pass through the animal undigested, because the tough seed coats resist the action of the digestive juices.

It is seldom profitable to grind corn for swine and sheep except for the very young animals, but it is frequently economical to grind the oats, wheat, and barley fed to them. Grinding oats increases their palatability to swine. Horses make good use of whole corn and oats, but the barley and wheat fed them should be ground.

Calves and yearlings digest grains more completely than older cattle. Since grinding saves 10 to 15 per cent of the grain fed to mature cattle, it is usually economical to grind grain for dairy cattle. For beef cattle grinding grain is practiced much less frequently, since hogs usually follow fattening cattle and

recover most of the whole grain in the droppings. If no hogs follow, grinding grains is desirable. Old animals with poor teeth make much better use of grains fed in ground form.

Corn cobs have practically no nutritive value, but it is sometimes more economical to grind the ears than to shell and grind the grain.

Careful experiments show that with roughages grinding does

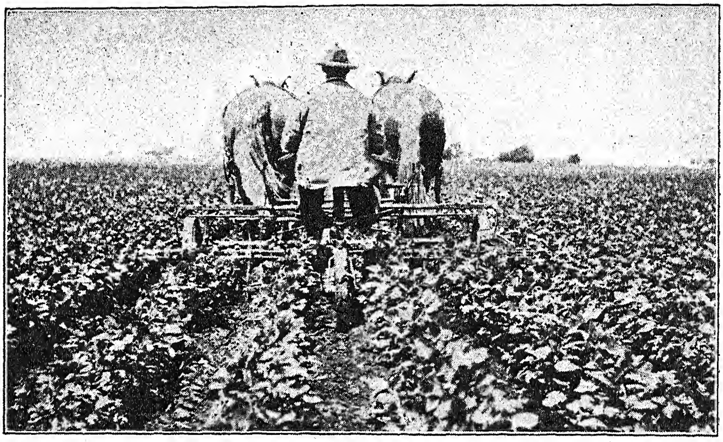

FIG. 41.—GROWING SOYBEANS IN ROWS

This method of culture makes it possible to keep the crop fairly free from weeds and thus secure hay of good quality; hence it is particularly desirable on land that has become badly infested with weeds. Weedy hay, as a rule, not only is low in feeding value but also requires extra labor in feeding and cleaning mangers. Even coarse-stemmed soybean hay, when of good quality, is eaten with but little waste.

not increase the digestibility as it does in the case of grains. When the coarse roughages are ground, however, it does reduce the amount of refused feed and thus makes the supply go somewhat farther. Whether or not to grind corn stover, soybean hay, and other coarse roughages, then, will depend on whether the livestock will eat enough more feed to warrant the expense. The coarse stalks of these roughages are very low

in protein and very high in fiber, indicating low digestibility. Experiments with dairy cows have shown that grinding soybean hay increased its nutritive value about 5 per cent, but it is seldom that an increase so small would be worth the cost of grinding. Cutting the hay by means of a silo filler gave nearly as good results as grinding.

Since good-quality roughages, such as alfalfa, red clover, and timothy hay, are freely consumed with but little waste when fed in whole form, it is evident that there is seldom any advantage, either from the nutritive standpoint or the standpoint of saving feed, in grinding them. Possibly the one exception is in the case of beef cattle which are being fed in open bunks, when the grinding of the hay will lessen the amount which is pulled out from the bunks and wasted under foot.

Low-grade hays and fodders which have been damaged by exposure to weather are sometimes ground and mixed with grain in order to increase the amounts of roughage consumed. It is questionable whether one can afford to feed poor-quality materials of this sort or the coarsest parts of corn stalks and soybean hay to high-producing livestock. For maximum returns, stock must be given high-quality feeds, and their digestive systems must not be burdened with unnecessary amounts of indigestible substances.

Occasionally convenience in transportation and feeding and saving in storage space make it desirable to grind roughage even though it is not economical from the standpoint of increased feeding value.

Cooking feed does not, as a rule, increase its feeding value, but may actually lower the digestibility of the protein. Steaming and fermenting, or attempting to predigest feeds by the use of malt or other so-called converters, have been found to have little effect in increasing feeding value, and the additional expense, in most cases, is not warranted.

BALANCING A RATION REQUIRES CAREFUL CONSIDERATION

It has been pointed out that animals need certain nutrients in definite proportions and amounts. After studying the composition of feeds and their individual characteristics, the next problem is to select and combine these feeds so as to make up a ration which will supply these needs of the animal, and supply them as economically as possible.

The term *ration* is used in a broad sense to mean the kind of feed or merely the amount of feed being supplied an animal. In a more restricted sense, however, the term means the feed allotted to an animal for a period of twenty-four hours. When the ration contains the proper assortment and almost exact amounts of all the substances necessary for the nourishment of the animal for a given purpose over a twenty-four hour period, it is said to be a *balanced ration.* Feed which supplies the nutrients necessary to nourish an animal properly for a twenty-four period when it is neither gaining nor losing weight, doing no work nor yielding any product, is termed a *maintenance ration.*

In all rations there are certain points which must be given consideration. Briefly they are as follows:

The kind of ration to be used depends upon the species and class of animal and the function it is performing or the purpose for which it is being fed. A pig or steer being fattened, for example, requires a different ration than that given an idle horse being carried through the winter. A dairy cow producing large amounts of milk will require a still different ration.

Palatability is a prime essential in all rations but especially in rations for fattening animals and high-producing dairy cows. In these cases the rapidity of gains and amounts of milk are dependent upon the amounts of feed consumed, and the more palatable the feed, the greater will be the feed consumption, gains, and financial returns.

Fresh green, growing feeds are the most palatable for horses, cattle, and sheep, while silage and roots are close seconds.

Farm grains and hays in good condition, soaked beet pulp, and feeds mixed with molasses are also very palatable. The farm grains are most palatable to swine. Feeds which are badly weathered or moldy are likely to be unpalatable and may cause sickness.

The *digestibility* of the feed, that is, the proportion of a feed actually available to an animal, must be reasonably high if the animal is at hard work or is being fattened. Swine cannot subsist or be fattened entirely on alfalfa hay alone even if it is of the finest quality, for their stomachs are too small to take care of so much bulk and they can digest but small amounts of fiber. A hard-working horse cannot secure enough energy from straw or corn stalks since its digestive capacity is too limited. Animals being fattened quickly and horses at hard work must have feeds such as the farm grains which are high in digestibility and energy. In such cases feeds which are largely indigestible are a distinct handicap.

In order to plan rations for any class of animals, it is necessary to know what proportion of the nutritive content of each feed is digestible by that particular class. The percentage of a feed which is digestible is termed its *coefficient of digestibility.* It varies with different kinds of animals, and may be found by simple feeding experiments.

Proper *balance* of the nutrients in a ration is essential both for the health and productivity of the animal and for the highest returns. Protein in particular must be supplied in proper amounts and in proper proportion to the other nutrients. When this is done the correct proportion and amounts of the carbohydrates and fats are automatically supplied. Attention must also be given to providing sufficient amounts of minerals and vitamins.

In order to calculate a balanced ration it is necessary to select the feeds and calculate the amounts carefully according to a feeding standard. A *feeding standard* is merely a tabular statement of the nutrients required by a certain animal. In some standards, such as that for dairy cows, nutrients are

prescribed for maintenance and additional amounts for each pound of milk produced. In other standards, such as those for growing beef cattle and swine, the amounts of nutrients prescribed for the daily maintenance and for growth are combined. A method of calculating a balanced ration is shown on page 139.

The *effect of the feed on the quality of the product* is a factor of importance. Large amounts of peanuts and soybeans, for example, when fed to swine cause soft, greasy pork, while feeds like rape, turnips, cabbage, green wheat, green rye, sweet clover, and silage often cause bad flavors in the milk of dairy cows. Weeds such as wild onion, wild garlic, and ragweeds may produce such strong flavors in milk and cream that the products are unsalable.

The *effect of individual feeds on the health and thrift of the animal* must be considered. As noted in the discussion of the characteristics of feed, the physiologic effects vary greatly. The dry non-legume roughages, such as timothy, millet, and prairie hays and corn stover, cause a constipated condition. Wheat bran, linseed meal, and soybeans are laxative in their effects. Linseed meal and seeds high in oil, such as soybeans, peanuts, and sunflower seed, make the hair glossy and give the coat a sleek appearance

The *cost* of the ration is deserving of much more study than is usually given it by the feeder, for the profit in feeding is often determined by the ability to secure the needed nutrients in the lowest-priced feeds.

COSTS OF NUTRIENTS MAY BE READILY COMPUTED

The comparative prices of feeds change frequently. To secure the greatest economy in feeding, one must calculate the cost of the nutrients in the feeds available. Sometimes wheat may be a cheaper feed than corn. Cottonseed meal may be the cheapest source of protein at one time and the following season corn gluten feed may be the cheapest. The following simple methods of calculation may be used.

Suppose wheat, corn, and oats are raised on the farm and

the market prices are 80 cents a bushel for wheat, 79 cents a bushel for corn, and 34 cents a bushel for oats. Wheat has 60 pounds to the bushel, corn 56 pounds, and oats 32 pounds.

$\frac{\$.80}{60} \times 100 = \$1.33$, the value of 100 pounds of wheat.

$\frac{\$.79}{56} \times 100 = \$1.41$, the value of 100 pounds of corn.

$\frac{\$.39}{32} \times 100 = \$1.22$, the value of 100 pounds of oats.

These results seem to indicate that the cheapest feed is oats, but these grains differ in the amounts of total digestible nutrients in 100 pounds, as shown in Table 7. Using the values for total digestible nutrients as given in this table, the cost of 100 pounds of nutrients in each of the feeds is calculated as follows:

$\frac{\$1.33}{80} \times 100 = \$1.66$, the cost of 100 pounds total digestible nutrients in wheat.

$\frac{\$1.41}{80} \times 100 = \$1.76$, the cost of 100 pounds total digestible nutrients in corn.

$\frac{\$1.22}{70} \times 100 = \$1.74$, the cost of 100 pounds total digestible nutrients in oats.

Thus it is found that wheat is the cheapest source of total digestible nutrients at the prices given.

The cost of a pound of total protein or digestible protein may be calculated in much the same way. The digestible protein is, of course, somewhat more accurate as a basis for the comparison of feeds, but in the case of mixed feeds this content usually is not stated. A comparison on the basis of the cost of a pound of total protein is usually of sufficient accuracy.

Assuming that cottonseed meal, 43 per cent protein, is priced at \$2.40 a hundredweight, wheat bran, 15 per cent

protein, is priced at \$1.40 a hundredweight, and a ready-mixed feed, 32 per cent protein, is priced at \$2.25 a hundredweight, which feed furnishes total protein most cheaply?

Cottonseed meal:

43 pounds protein cost \$2.40, or 1 pound costs $\frac{\$2.40}{43} = \$.056.$

Wheat bran:

15 pounds protein cost \$1.40, or 1 pound costs $\frac{\$1.40}{15} = \$.093.$

Mixed feed:

32 pounds protein cost \$2.25, or 1 pound costs $\frac{\$2.25}{32} = \$.07.$

This simple computation shows wide differences in the cost of protein in different feeds and also shows that the feed selling for the lowest cost per hundred pounds may not be the cheapest source of protein. One of the important steps in securing economical rations, therefore, is to consider carefully the costs of both protein and total digestible nutrients in the feeds available.

SAVINGS ARE POSSIBLE IN PURCHASING CONCENTRATES

The prices of high-protein feeds usually advance in the fall after the close of the pasture season and drop again in the spring shortly before the close of barn feeding, when pasture becomes available. Prices in summer may be \$5 to \$15 a ton less than in winter. Since most protein supplements may be stored in a dry place for 8 to 12 months without noticeable loss of feeding value, there is often an opportunity to save money by purchasing the year's supply in the summer.

A further means of reducing feed costs is for a group of farmers to make up an order for 20 to 25 tons of feed (a carload) and place the order with the local dealer. If the buyers take the feed directly from the car the costs of handling, storage, and bookkeeping are greatly reduced. Paying cash may make a further worthwhile saving.

THE DIGESTIBLE-NUTRIENT METHOD OF BALANCING RATIONS

No matter what class of animal is being considered, the method followed in balancing the ration is much the same. Suppose it is desired to balance a ration for a dairy cow weighing 900 pounds and yielding 40 pounds of 5 per cent milk daily. The feeding standard for dairy cows (Table 6) shows that a cow requires daily for maintenance .7 pound digestible protein and 8 pounds total digestible nutrients for each 1000 pounds live weight. A 900-pound cow would require nine-tenths as much, or .63 pound digestible protein and 7.2 pounds total digestible nutrients.

The table shows further that each pound of 5 per cent milk requires for its production .07 pound digestible protein and .39 pound total digestible nutrients. Forty pounds of milk would require 40 × .07 pound digestible protein, or 2.80 pounds digestible protein, and 40 × .39 pound total digestible nutrients, or 15.60 pounds total digestible nutrients. Arranging these results in tabular form we have:

Daily Requirements	Digestible Protein	Total Digestible Nutrients
	Pounds	*Pounds*
For maintenance of 900-pound cow.	0.63	7.20
For 40 pounds 5% milk...........	2.80	15.60
Total requirements.............	3.43	22.80

Feeds must be selected, therefore, which will yield 3.43 pounds digestible protein and 22.80 pounds total digestible nutrients. Keeping in mind the qualities of a good ration and the character of individual feeds as already discussed, we select the roughage first because it is often abundant on the farm and when this is the case it is usually a more economical source of nutrients than the grains. Experience shows that when both hay and corn silage are fed, cows eat from ¾ to 1½ pounds of hay and 2½ to 4 pounds of silage daily to each 100 pounds of live weight. When dry roughage only is fed, from 1½ to

2 pounds daily are eaten. In this case we shall feed 9 pounds of hay and 27 pounds of silage. Turning to Table 7, which shows the composition of feeds, the amounts of nutrients in the roughage are calculated as follows:

10 pounds digestible protein in 100 pounds alfalfa hay = .10 pound in 1 pound.

9 pounds × .10 pound = .90 pound digestible protein.

51 pounds total digestible nutrients in 100 pounds alfalfa hay = .51 pound in 1 pound. 9 pounds × .51 pound = 4.59 pounds total digestible nutrients.

In the same way it is found that 27 pounds of silage furnish .27 pound digestible protein and 5.40 pounds total digestible nutrients.

Feeds	Digestible Protein	Total Digestible Nutrients
	Pounds	*Pounds*
9 pounds alfalfa hay	0.90	4.59
27 pounds corn silage	0.27	5.40
Total nutrients in roughage	1.17	9.99

The next step is to subtract the amounts of nutrients in the roughage from the total amounts required, as follows:

	Digestible Protein	Total Digestible Nutrients
	Pounds	*Pounds*
Nutrients required	3.43	22.80
Nutrients furnished in roughage	1.17	9.99
Nutrients needed in grain mixture	2.26	12.81

A mixture of farm grains and high-protein feeds contains about .75 pound total digestible nutrients per pound of mixture. By dividing the total digestible nutrients needed, namely, 12.81, by .75, we find that about 17 pounds of grain mixture will be required to balance the ration. Again, by dividing the digestible protein needed, 2.26 pounds, by 17, the amount of grain mixture required, and multiplying by 100, it

is found that the grain mixture must contain about 13 per cent digestible protein. This means that the grain mixture may be made up largely of farm grains, with a small proportion of protein supplements added to bring the protein up to the required level. A trial mixture may now be calculated, using the figures for the composition of feeds given in Table 7.

Amounts of Feeds	Digestible Protein	Total Digestible Nutrients
	Pounds	*Pounds*
8 pounds ground shelled corn.....	0.56	6.40
4 pounds ground oats............	0.40	2.80
4 pounds wheat bran.............	0.48	2.44
1 pound cottonseed meal.........	0.36	0.76
17 pounds total..................	1.80	12.40

This mixture is too low in the amount of digestible protein but the amount of total digestible nutrients is sufficiently close to the requirements. Adding another pound of cottonseed meal brings the total nutrients in 18 pounds of mixture to 2.16 pounds digestible protein and 13.16 pounds total digestible nutrients. These amounts are close enough to the theoretical and the ration may be considered a balanced one.

TABLE 6

FEEDING STANDARD FOR DAIRY COWS

	Digestible Protein	Total Digestible Nutrients
For daily maintenance:	*Pounds*	*Pounds*
Per 1,000 pounds live weight............	0.7	8.0
To above allowance for maintenance add:		
For each pound 3.0 per cent milk........	0.050	0.27
For each pound 3.5 per cent milk........	0.055	0.30
For each pound 4.0 per cent milk........	0.060	0.33
For each pound 4.5 per cent milk........	0.065	0.36
For each pound 5.0 per cent milk........	0.070	0.39
For each pound 5.5 per cent milk........	0.075	0.42

TABLE 7

Nutrients in 100 Pounds of Common Feeds

(Expressed in Pounds)

Feed	Total Dry Matter	Total Protein	Total Fiber	Digestible Nutrients	
				Protein	Total
Concentrates:					
Barley	90	11	5	9	79
Beet pulp, dried	90	9	19	5	70
Cocoanut meal or cake, old process	90	21	10	19	79
Corn, dent, shelled, grade No. 3	85	9	2	7	80
Corn-and-cob meal	85	8	8	6	64
Corn germ meal	90	22	9	16	82
Corn gluten feed	90	23	7	20	80
Corn gluten meal	90	40	2	34	84
Cottonseed meal or cake, 43% protein	90	43	7	36	76
Cottonseed meal or cake, 41% protein	90	41	10	33	74
Cottonseed meal or cake, 36% protein	90	36	10	29	70
Cottonseed hulls	90	4	44	0	40
Cowpea seed	90	24	4	20	78
Hominy feed	90	10	4	7	85
Linseed meal, new process	90	37	9	32	76
Linseed meal, old process	90	34	8	30	77
Molasses, cane, or blackstrap	75	3	0	1	60
Oats	90	12	11	10	70
Peanut oil meal, from shelled nuts	90	43	7	39	81
Rye	90	12	2	10	81
Soybean oil meal	90	40	5	37	76
Soybean seed	90	37	4	32	96
Tankage (60% protein)	90	60	5	55	70
Wheat	90	12	2	9	80
Wheat bran	90	15	9	12	61
Wheat middlings, standard	90	16	6	13	70
Milk:					
Whole milk (cow's)	13	3	0	3	16
Skim milk	10	3	0	3	9
Skim milk, dried	98	35	0	33	89

TABLE 7—*Continued*

Feed	Total Dry Matter	Total Protein	Total Fiber	Digestible Nutrients	
				Protein	Total
Roughages:					
Alfalfa hay	90	15	28	10	51
Alfalfa leaves	90	21	12	16	58
Bluegrass hay	90	8	29	5	54
Clover, alsike, hay	90	13	26	8	49
Clover, red, hay	90	13	26	8	53
Clover, sweet, hay	90	14	27	6	30
Corn fodder, dry (with ears)	90	7	27	3	44
Corn fodder, green (with ears)	23	2	22	1	16
Corn silage	30	2	7	1	20
Corn stover, dry (without ears)	90	6	31	2	38
Cowpea hay	90	19	23	11	41
Cowpea straw	90	7	44	2	26
Millet, common, or Hungarian, hay	90	9	25	5	58
Oat hay	90	9	29	5	48
Oat straw	90	4	41	1	30
Redtop hay	90	7	29	5	53
Soybean hay	90	14	29	9	42
Soybean straw	90	4	44	0	24
Sunflower silage	21	2	10	1	10
Timothy hay	90	6	30	3	49
Roots, etc.:					
Beet, common	13	2	1	1	10
Beet, sugar	16	2	1	1	14
Mangel	9	1	1	1	7
Potatoes	21	2	1	1	17
Pumpkins, field	8	1	1	1	7

COMMUNITY AND CLASSROOM STUDIES

1. Bring from home or secure from your local feed stores, small samples of mill by-products such as wheat bran, cottonseed meal, etc., and also ground and unground samples of farm grains. Copy the percentages of protein given on the tags or sacks of the mill feeds on small cards. (*a*) Arrange the samples and cards on a table and study them so that you can readily identify them and can state the percentage of protein in each. (*b*) Compare the samples of each kind of farm grains and rank them according to quality from a feeding standpoint (dryness, freedom from mold, damaged and shrunken grains, etc., to be considered).

2. (*a*) Bring from home one- or two-pound samples of each kind of hay

available. Compare the samples of each kind of hay brought by members of the class and rate them excellent, good, fair, poor, according to quality. (*b*) Weigh out a one-pound sample of each on a scale which will weigh to $\frac{1}{10}$ pound or less, and separate the samples into leaf and stem portions (also pods and seed in the case of soybean hay, etc.). Compute the percentage of the hay formed by each part. Compare the percentage of leaves with the rating assigned in part (*a*). Is there any relationship?

3. Secure from your local feed store prices of feeds together with the percentage of protein in each. Compute the cost per pound of protein in each. Determine also the cost of one pound of total digestible nutrients in each feed for which an analysis is given in Table 7. Do high- or low-protein feeds furnish protein the more cheaply? How do farm grains compare with other feeds as economical sources of protein? Write a discussion of your results.

4. Learn the approximate yield of each feed crop (corn, oats, hay, etc.) grown on your farm during the past year. Compute the yields of digestible protein and total digestible nutrients in each crop. Prepare a table setting forth the results secured by each member of the class. Write a discussion of the results. How do corn and oats compare as sources of total digestible nutrients? Does corn silage yield more than corn grain? Do legumes yield more than non-legumes?

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CHAPTER VIII

FEEDING DAIRY CATTLE

THE most important operation in the care and management of a herd of dairy cattle is the feeding. Milk yields and profits are so largely dependent upon proper feeding each day throughout the year that the subject deserves much study. As a rule, the cost of feed represents about one-half the total expense of keeping dairy cattle.

To be successful with dairy cattle, as with other livestock, one must be genuinely interested and sympathetic with the work. Dairy cows are very sensitive to the conditions which surround them and respond quickly to good or poor treatment. Study good textbooks and bulletins such as those listed at the close of this chapter, and at your first opportunity visit dairy herds which are returning a profit and note their management. Nothing will add more to your interest in dairying than watching the actual operations. If possible in your community, take out membership in a dairy herd improvement association and in other cooperative organizations in which information on improved methods is given the members.

The several operations in feeding dairy cattle may be listed as follows:

Management Problems:

1. Feeding dairy cows in winter.
2. Feeding dairy cows during pasture season.
3. Feeding and caring for dairy cows at calving tine.
4. Feeding dairy calves.
5. Feeding dairy heifers.
6. Feeding dairy bulls.
7. Preventing mineral deficiencies.
8. Preventing vitamin deficiencies.

1. Feeding Dairy Cows in Winter.—The winter feeding of cows is more expensive, as a rule, than feeding during the pasture season. The feeds are more costly and more labor is required. Then, too, more care and planning are necessary to secure suitable rations for barn feeding.

Considerations:

- (*a*) Planning crops for winter feeding.
- (*b*) Selecting economical feeds.
- (*c*) Balancing the ration.
- (*d*) Preparing the feed.
- (*e*) Feeding silage and roots.
- (*f*) Feeding grain mixtures.
- (*g*) Feeding hay and other dry roughage.

(*a*) *Planning Crops for Winter Feeding.*—There are such wide differences in the yields of protein and total digestible nutrients in different crops that an effort should be made in planning feed crops to select those which give the greatest return from the feeding standpoint. Study the figures given in Table 5 and note which crops give the largest yields of nutrients. If possible to grow legumes on your farm, consider the many desirable qualities they will give you in your ration, as pointed out in Chapter VII, aside from their high protein content. Where legumes can be grown readily, the protein produced in these crops usually costs less than in purchased feeds.

Note the advantage of feeding the whole corn plant as silage as compared with feeding the ears only, and note also that when corn silage and legume hays are available, most of the qualities of an ideal ration are secured.

It may not be profitable to devote all your tillable acreage to feed crops. Oats give only a small return to the acre as feed and there are many farms on which cash crops such as wheat, potatoes, tobacco, etc., are more profitable than feed crops. In such cases the most profitable practice may be to grow but a few feed crops, including always corn for silage and legumes

for hay in order to provide the roughage needed, and then purchase all the grain to be fed.

(*b*) *Selecting Economical Feeds.*—Some feeds furnish protein and total digestible nutrients much more cheaply than others. A high price per ton does not necessarily mean an expensive feed, for often the highest-priced feeds are the cheapest sources

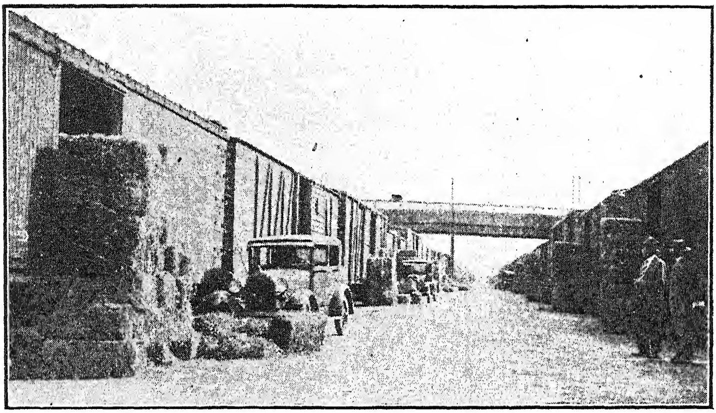

FIG. 42.—ALFALFA ON THE TRACK READY FOR SALE

On the market mornings, a "plug" of fifteen to twenty bales is removed from each car and the bales arranged in the form of steps leading up to the car door so that buyers may enter and inspect the hay. The picture shows one of the hay tracks at Kansas City, the largest hay market in the world. From here shipments are made to many other states. The acreage of legumes on dairy farms in the central and eastern states is increasing steadily, for dairymen are finding this an economical method of securing protein.

of protein. In making your selection, first secure the prices of the feeds which are available at your local feed store and calculate the cost of protein and total digestible nutrients for each feed, as outlined in Chapter VII. Then study the characteristics of the feeds you find are the cheapest sources of nutrients, as discussed in the same chapter, and select feeds which will be suitable to use with the roughages you have.

(*c*) *Balancing the Ration.*—Large amounts of feeds given

dairy cattle are wasted because they are not suitable for the purpose or are not fed in amounts suitable to the needs of the animals. Calculating rations is one of the most profitable uses of time in the livestock enterprise.

Two different methods for balancing a ration are commonly used—the digestible-nutrient method and the total-protein. The first, which is explained in Chapter VII, is the more accurate under most conditions. It requires more calculations and a knowledge of various facts such as the live weight of the animal and the butterfat content of the milk. However, the total-protein method is the simpler and has the advantage of making allowance for a variation in the quality of the roughage. Both methods should be studied carefully and the one that seems best suited to the individual needs should be learned so that it can be used with ease.

Total-protein Method.—The only facts necessary to know in calculating a balanced ration by the total-protein method are the total protein contents of the feeds used. For the farm grains these figures are easy to learn and keep in mind; for the purchased concentrates they may be found on the tags attached to the feed sacks. Since the ration is calculated in terms of total protein, the cost may be readily and fairly compared with the cost of a ready-mixed feed of similar protein content. The procedure is as follows:

When the roughage consists entirely of legume hays, such as alfalfa, clover, cowpea, or soybean hay (that is, when no stover, silage, pasture, or non-legume hay is included), a grain mixture containing from 12 to 14 per cent total protein should be used.

When the roughage consists of legume hay fed in liberal amounts and also silage, stover, or non-legume hay, or when the roughage is mixed hay of which half or more is legume, a grain mixture containing from 14.1 to 16 per cent total protein should be used, the variation depending on the quality of the hay.

When the roughage consists entirely of non-legumes, such

as timothy or redtop hay, corn stover, corn silage, the sorghums, etc., a grain mixture containing from 16.1 to 20 per cent total protein should be used.

The success of the plan is largely dependent upon the ability of the feeder to judge the quality of the roughage fed. When it may be classed as excellent, the lower protein requirement given in each case is used, but if it has been weathered badly, has few leaves, or contains a high proportion of weeds, a higher figure must be used. For example, when green, leafy, fine-stemmed alfalfa hay forms the only roughage, 12 per cent total protein in the grain mixture is sufficient, while if the hay is very coarse-stemmed and has few leaves, 13 or 14 per cent protein may be required, and if a considerable proportion of foxtail or other weeds is present, a protein content of 15 per cent may be necessary in the grain mixture fed with it.

Problem.—Medium-quality clover hay and corn silage are being fed. Calculate the formula for a suitable grain mixture.

Referring to the rules given above, it will be noted that when legume hay and corn silage comprise the roughage, 14.1 to 16 per cent total protein is needed in the grain mixture. With medium-quality hay, about 15 per cent is required.

It is evident from Table 7 that a mixture of farm grains alone would not fulfill the requirements, since the highest protein in these grains is about 12 per cent. Hence one or more feeds high in protein will have to be added to the mixture. The calculation is made as follows:

Amount of Feed Used	Kind of Feed	Protein in 100 Pounds of Feed	Protein in Amount of Feed Used in Mixture
		Pounds	*Pounds*
400 pounds	corn-and-cob meal.........	8	32
200 pounds	ground oats...............	12	24
200 pounds	wheat bran................	15	30
100 pounds	cottonseed meal, 43% protein	43	43
900 pounds	total..................	....	129

$129 \div 900 \times 100 = 14.3$, which is the percentage of protein in the mixture. This is too low, so we add:

25 pounds cottonseed meal, 43% protein............	43	11
75 pounds ground oats.........	12	9
1,000 pounds total...............	....	149

$149 \div 1000 \times 100 = 14.9$, the percentage of protein in the final mixture. This is close enough to the required amount.

(*d*) *Preparing the Feed.*—Having calculated a formula for a suitable grain mixture, weigh out or measure the feeds carefully. Grind feeds such as corn, oats, barley, and soybeans to medium fineness. Spread these feeds in a long, low pile on a clean floor, preparatory to mixing. Flatten the top of the pile and add the protein feeds. Add 1 pound of salt for each 100 pounds of mixture, or 2 pounds if the cattle do not receive salt from any other source. Mix thoroughly by shoveling over the pile several times.

As stated in Chapter VII, the grinding of hay and stover is unnecessary and often uneconomical. The same is true of the various fermentation and malting processes. Mixing ground roughages and ground grains for dairy cattle is not a good practice, since it prevents feeding in proportion to the needs of the individual animal.

(*e*) *Feeding Silage and Roots.*—Feed silage in moderate amounts. If fed too heavily it may cause too laxative a condition in the animals and also it may result in their not eating enough hay. Unless you are experienced in measuring silage with a silage fork, weigh it in a basket until you become familiar with the amounts which should be given. From 2½ to 3 pounds of silage to each 100 pounds of live weight of the animal gives good results, although more than these amounts is fed in some cases. Feeding silage as the only roughage is not a good practice since it does not contain sufficient minerals and vitamins.

Feed silage twice a day. If it has a strong odor, feed it after milking, as otherwise the milk might absorb the odor.

Feed roots in much the same amounts as silage if an abundant supply is available. If the supply is limited, feed a small amount once daily over as long a period as possible. Trim off decayed portions and slice the roots in a root cutter or by hand before feeding.

(*f*) *Feeding Grain Mixtures.*—The only way in which grain mixtures can be fed to dairy cows economically is to feed them in proportion to milk production. To do this, learn the production of each cow by carefully weighing her milk. This is preferably done at each milking so that the feeder can note the effect of increases or decreases in feed on the milk yield, but if this cannot be arranged, weigh the milk at both milkings one day a week. Keep an accurate record of the milk weights. Make out a chart for each cow showing the amount of grain mixture to be fed at each feeding. Thus, if Cow No. 17 is producing 27 pounds of milk daily and the rate of feeding grain is 1 pound of grain to 3 pounds of milk, feed this cow 9 pounds of grain mixture daily, or 4½ pounds at each feeding. The grain may be weighed or measured carefully by the use of a specially designed measure or a pail with vertical sides marked on the inside to indicate pounds or quarts.

FIG. 43.—WEIGHING THE GRAIN MIXTURE FOR DAIRY COWS

Next to calculating a suitable ration, the weighing of the grain mixture for each cow is the most profitable use of time in the feeding of dairy cattle. Note the handy feed truck and the dial scale.

The rate of feeding grain mixture to cows of the different breeds when roughage is being fed liberally is as follows:

Producing Daily:	Feed 1 Pound Mixture for Each:
HOLSTEINS, BROWN SWISS, and AYRSHIRES	
25 pounds or less	4 pounds milk
26 to 35 pounds	$3\frac{1}{2}$ pounds milk
36 pounds or more	3 pounds milk
JERSEYS and GUERNSEYS	
25 pounds or less	3 pounds milk
26 pounds or more	$2\frac{1}{2}$ pounds milk

Consider these rules as general guides only and do not depend upon them to meet all needs. Roughages vary greatly in quality and cows differ widely in the amounts of roughages they eat as well as in the percentage of fat in their milk. For these reasons treat each cow as a unit, increasing or decreasing the amounts of grain mixture fed with changes in production. At all times, except when drying off the cow, make an effort to secure the greatest possible production from each animal.

(*g*) *Feeding Hay and Other Dry Roughage.* — Roughage grown on the farm is usually a cheaper source of nutrients than grain mixtures, although this is not always the case. Good-quality hay, particularly legume hay, furnishes protective factors such as lime and vitamins and insures beneficial physiological effects, which also aid the animal in its resistance against disease. For these reasons, good hay should be fed in liberal amounts. Moldy, weather-damaged hay, if used at all, must be fed with caution.

While good hay should be fed practically to the limit of the appetite, it should not be fed wastefully so that good portions are left in the mangers to be nosed over. When using hay having coarse stems, such as soybean hay, do not force the cows to consume the coarsest portions, but remove them from the mangers and give them to the heifers or other livestock. Feed hay after milking in order to avoid dust in the air at milking time.

A greater consumption of hay is secured by feeding three times daily instead of twice. As a rule, more hay should be given at the afternoon feeding than in the morning.

When weather is sufficiently mild for cows to remain outdoors, hay may be fed in a rack in the exercising yard, for under outdoor conditions cows eat more roughage with less waste than they will indoors. Other dry roughages, such as shredded stover, threshed clover, soybean, cowpea, and redtop, may be used in limited amounts as supplements to good-quality hay but must not replace it entirely if the best results are to be secured.

2. Feeding Dairy Cows during Pasture Season.—One of the most common mistakes in feeding dairy cattle is turning them to pasture too early in the spring. Grazing off the first tender shoots of grass and keeping the pasture closely grazed early in the season not only greatly retards the top growth and delays the time when good pasturing is available, but also greatly reduces the total yield from the pasture during the summer. Watch the conditions in the pasture carefully, therefore, and turn the cattle in only after the pasture plants have reached a height of five or six inches.

As a prevention of bloat, it is a good plan before turning the cows to pasture the first time to feed them their usual allowance of silage, hay, and grain, and leave them on pasture for only about an hour. Follow this practice for several mornings, increasing each day the length of time on pasture. As a further precaution against bloat, be sure that the plants are not wet from dew or rain during the first few days when turning the cattle to pasture.

When using legumes, particularly sweet clover, as pasture, provide some dry straw or hay in a rack in the pasture. If the cows are being pastured on sweet clover they should be kept there continuously except during the milking hours, as a preventive of bloat.

Jersey and Guernsey cows producing more than 20 pounds of milk daily, and Holsteins, Brown Swiss, and Ayrshires yield-

ing over 30 pounds daily, must be provided with feed in addition to pasture if they are to maintain their weight and health. In early spring a grain mixture consisting simply of ground grains, such as corn, oats, and barley, is the best supplement to pasture. For Jerseys and Guernseys, feed this at the rate of 1 pound for each 3 pounds of milk produced in excess of 20 pounds daily. In the case of the other dairy breeds, feed 1 pound for each 3

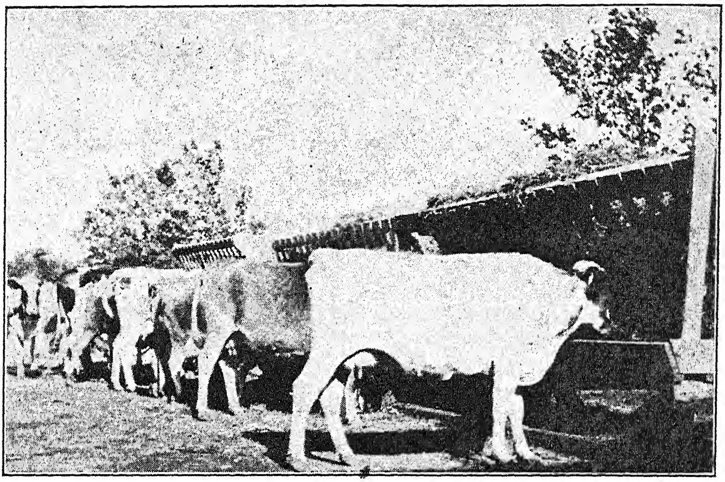

FIG. 44.—SUMMER FEEDING HELPS MAINTAIN MILK YIELDS

Feeding legume hay or legume hay and silage is an excellent method of supplementing short, dry pastures. A grain mixture alone or silage alone is often insufficient under such conditions.

pounds in excess of 30 pounds daily. For example, if a Jersey cow yields 35 pounds of milk daily, feed her 5 pounds of grain mixture daily.

As grass matures, the proportion of protein becomes lower. After bluegrass has headed out and after legumes have reached the bloom stage, from 14 to 15 per cent protein is needed in the grain mixture. When bluegrass and timothy are ripe and have become light-colored and dry, the supplementary grain

mixture must contain as much as 16 to 18 per cent protein. Legumes, even when ripe, never become so low in protein as non-legumes, and the grain mixtures used to supplement legume pastures need never contain over 14 to 15 per cent protein.

The supplementing of pasture is simple as long as the grass is plentiful. Beginning in midsummer, however, pastures often fail rapidly, and whenever they do not supply sufficient roughage for the cows it is best to provide some green feeds, hay, or silage in addition.

Legumes have several advantages over non-legumes as pasture crops. They usually furnish feed one to two weeks earlier in the spring than bluegrass pastures and continue to grow and furnish green feed for a longer time during hot, dry weather. One of the greatest advantages is the larger yield of nutrients to the acre than is given by non-legume pastures. The higher protein content of the legumes lessens the amount of protein necessary in grain mixtures and thus lessens the cost of supplementary feeding as compared with the cost when non-legume pasture crops are being used. Sweet clover, red clover, and alfalfa are legumes commonly used as pasture crops.

Emergency pastures may be seeded in the spring so that they will be ready for use by the middle of the summer. A combination of peas and oats, or of peas, oats, and vetch, is very satisfactory for this purpose in some of the north central and northeast sections of the United States. Farther south, sudan grass, millet, the sorghums, and oats sown late may be used. Oats-and-rape pasture is sometimes used for other livestock but may cause objectionable flavors in the milk of dairy cows.

Another plan of providing fresh green feed is to use various growing crops, such as alfalfa, clover, soybeans, millet, and corn, cutting required amounts each day and hauling to the pasture or barn.

Corn silage is commonly used for supplementing dried-up pasture. It is an excellent feed and is usually an economical one for this purpose.

One precaution must be taken in the use of these supplementary pastures and feeds. All the crops mentioned, with the exception of the legumes, are very low in protein and must not be relied upon as the only supplements to short pastures. A common fault in the use of corn silage for summer feeding is to fail to provide additional feed with it. All these low-protein feeds require the addition of grain mixtures containing 15 to 18 per cent total protein.

Great injury to the succeeding year's growth of pasture crops results from close grazing of the pasture late in the fall. Discontinue pasturing cows as soon as the pasture crops show a marked decline in their rate of growth. This is usually after the first heavy frost. Do not permit cows to graze second-growth sorghum, particularly after frost, nor legume pastures when there is frost on the plants. To allow them to do so might result in severe indigestion or poisoning.

Begin the barn feeding of roughages in the fall as soon as the pastures fail. One of the common errors in the management of dairy cows is allowing them to become so thin in the late summer and fall that a period of several weeks of barn feeding is necessary to put them into condition so that they are able to produce at their normal level.

3. Feeding and Caring for Dairy Cows at Calving Time.—Dairy cows require special attention for a few weeks preceding and following calving. The care during this period may have a very important influence on the production of the cow during her succeeding lactation period.

Consult the breeding record of the herd and dry off the cows so that they are given a rest of 6 to 8 weeks before calving. During this period feed them liberally so that they are in a good state of flesh at calving time. Fresh green pasture, legume hays, and corn silage are good roughages for this period. A mixture of ground farm grains is satisfactory if legume hay or green pasture forms the roughage; otherwise, add some protein feed, such as wheat bran or linseed meal, to give the mixture a protein content of 14 to 15 per cent.

Feed enough to give the cows more flesh than usual, though they need not be excessively fat.

A week before calving, accustom each cow to a box stall. Be sure that the stall has been thoroughly cleaned and is kept well bedded and as dry as possible. Reduce the amount of grain mixture so that not over 2 to 3 pounds daily is being fed at calving time. In case no legume hay, silage, or green feeds are available, feed 3 or 4 pounds of wheat bran daily.

After calving, feed sparingly for a day or two, supplying legume hay and silage or pasture in moderate amounts. In the absence of these, give a warm bran mash daily for 2 or 3 days. To prepare this, place 3 or 4 quarts of wheat bran in a pail and add boiling water until it is thoroughly moistened. Dilute with cold water to bring the mixture to body temperature and feed while warm.

If the cow is a heavy milker, do not milk her completely dry the first day or two. This is a precaution against milk fever. If the udder is not caked badly, begin feeding grain mixture on the second day at the rate of 2 to 4 pounds daily. Increase the amount at the rate of ½ pound daily as long as the cow continues to respond with a proportionate increase in milk yield.

During the first day at least after calving, the drinking water should be lukewarm, and for a few days should not be colder than water as it comes from a deep well.

4. Feeding Dairy Calves.—There are a few simple rules which must be followed in order to insure success in the feeding of dairy calves. As the young calf is very sensitive to changes in feed and care, every effort must be made to procure the best conditions at the start and to keep them constant.

Paint the navel cord of the calf with tincture of iodine as soon after birth as possible. Allow the calf to nurse its mother from 1 to 3 days, making sure that it receives some of the first milk secreted. Separate strong, vigorous calves from their mothers after the first day and teach them to drink. Weak calves may be left with their dams from 2 to 5 days.

Feed fresh whole milk until calves are at least 21 days of age and have learned to eat grain and hay. After this time gradually replace the whole milk with skim milk, taking a week to make the substitution complete. Continue feeding skim milk until the calves are 4 to 6 months of age, and longer if a cheap supply is available. Feed whole milk and skim milk at the rate of 1 pound of milk daily for each 10 pounds live weight of the calf, until the maximum of 20 pounds daily is reached. Thus a calf weighing 70 pounds at birth would receive 7 pounds of milk daily, and from 200 pounds on it would receive 20 pounds daily. Milk is commonly fed twice daily but better results are secured with weak and very young calves if the milk is divided into three or four feeds daily. This is an especially good plan with young Jersey and Guernsey calves.

Weigh the milk at each feeding time and be sure that it is at about body temperature when fed and in a fresh, sweet condition. The foam should be removed from skim milk. Freshly soured milk may be fed to calves 4 to 6 months of age but it must be uniform from feeding to feeding. Wash daily the pails used in feeding and scald or treat with chlorine disinfectant solution frequently.

It is essential that calves receive milk in some form until they are at least 60 or 70 days of age. When fresh skim milk is not available, other plans of feeding may be used.

One plan is to feed the usual amount of whole milk, namely, 1 pound daily for each 10 pounds live weight, until 30 to 35 days of age and then gradually reduce the amount each week until no milk is being fed at 60 to 70 days. Only 400 to 500 pounds of milk are required for one calf under this plan. This method of feeding will prove successful only in the case of strong, vigorous calves which consume grain and hay freely. Other calves must receive milk for a longer time.

Another plan is to replace liquid milk with dried skim milk at the age of 6 to 7 weeks. The dried milk is added to the grain at the rate of about 35 pounds of dried milk in 100 pounds of the mixture. This mixture should be fed freely. The

proportion of milk should be gradually reduced until at 6 months of age none at all is being fed.

A good grain mixture may be prepared by combining ground shelled corn, ground oats, wheat bran, and linseed meal in equal parts by weight. For calves 4 to 6 months of age which receive milk and legume hay, 50 parts corn, 30 parts oats, 20 parts wheat bran, and 10 parts linseed meal, is a good mixture.

Hay should be fed liberally. Red-clover hay of good quality is one of the best roughages for dairy calves. Alfalfa hay is also good but may prove too laxative for some calves. Corn silage may be fed in small amounts to calves over 4 months of age.

Keep the calves as comfortable as possible at all times. Protect them from cold drafts and keep stalls dry and well bedded.

5. Feeding Dairy Heifers.—There is a tendency to neglect dairy heifers as soon as the milk-feeding period is past, particularly if the heifers are turned out to pasture at this time. Too often the feed supply is inadequate to replace the nutrients which they have been receiving in milk, and with the advent of hot weather and short pastures and the annoyance of flies, the growth of the heifers is seriously hindered. Rapid and constant growth is necessary in order to develop heifers into large, useful cows.

In winter, provide the heifers with good legume hay and corn silage. Feed all the legume hay which the heifers will eat without unnecessary waste, but limit the amount of silage to not more than 2 pounds daily to 100 pounds live weight. In addition to these roughages, feed grain mixture at the rate of $\frac{1}{3}$ to $\frac{1}{2}$ pound daily for each 100 pounds live weight. Thus a yearling heifer weighing 800 pounds should receive legume hay at will, about 16 pounds of silage, and $2\frac{1}{2}$ to 4 pounds of grain mixture daily. A grain mixture suitable for use with a certain class of roughage for milk production is also suitable with the same kind of roughage for the growth of heifers.

Heifers should gain at least a pound a day; those of the larger breeds should gain $1\frac{1}{2}$ pounds or more daily.

When non-legume roughage only is fed, be sure that plenty of protein is supplied in the grain mixture. It may be best to add about 2 per cent bone meal to the grain mixture, as discussed later under Section 7.

Watch heifers at pasture carefully to see that they are receiving plenty of good-quality feed. The same supplements suggested in Section 2 for dairy cows are also suitable for heifers. Young heifers tend to eat very little grass the first week or two after being turned out to pasture and may lose weight rapidly unless supplied grain mixture in liberal amounts. Provide fresh water, salt, and shade.

Low-grade roughages, such as corn-stalk pasture, corn stover, and straws of various kinds, have but a limited use in the feeding of dairy heifers. If used they must be supplemented with liberal amounts of high-protein grain mixtures, and also with some good legume hay if possible.

6. Feeding Dairy Bulls.—The same principles apply to the feeding of dairy bulls as to the feeding of dairy heifers and cows. The young bull must be kept growing even more rapidly than the heifers because he is expected to attain a size about 50 per cent greater than that of a dairy cow of the same breed.

The procedure outlined for the feeding of heifers also applies to the feeding of young bulls. Mature bulls require much the same kind of feed. Legume hays are most essential and may be fed liberally. Corn silage should be fed in but small amounts, such as 15 to 25 pounds daily, so that the amount of hay eaten will be large. A grain mixture suitable for cows receiving the same kind of roughage is also suitable for the bull. Feed this in sufficient amounts to keep the bull in a fair state of flesh, but do not permit him to become fat.

One of the best feeds for bulls is pasture. If possible, provide an enclosure of one to three acres in which he can be kept by himself. In the absence of pasture, supply some fresh green feeds, such as oats, rye, or wheat before they begin to ripen,

green clover or alfalfa, green corn, etc. In winter supply corn silage, as already mentioned, or roots. Feed roots at about the same rate as corn silage.

7. Preventing Mineral Deficiencies.—Too much emphasis during recent years has been placed on the mineral needs of dairy cows. So far as known at present, there are but five mineral elements which may be lacking in ordinarily good farm rations for dairy cattle. Two of these, sodium and chlorine, are the elements of common salt. All, or nearly all, rations are lacking in salt. Calcium, the important element of lime, may be lacking in rations containing no milk or legume hay. Phosphorus is sometimes lacking in rations containing no high-protein feeds, particularly if the roughages fed have been grown on a phosphorus-poor soil. Iodine may be lacking in sections near the Great Lakes and parts of Montana and possibly other western states where the drinking water is deficient in iodine.

Salt is best supplied in the form of crystal salt purchased in barrels or sacks. About 1 pound should be added to each 100 pounds of grain mixture. Additional amounts should be supplied in boxes at will to the cattle in the exercising yards.

Supply calcium to young calves by feeding skim milk and legume hay. Older cattle can be supplied through legume hay. In case this is not available, add 2 per cent of steamed bone meal to the grain mixture.

Most of the high-protein feeds such as linseed meal, cottonseed meal, and wheat bran are high in phosphorus content. Cows receiving grain mixtures containing enough of these feeds to balance them properly with respect to protein are not likely to suffer from phosphorus deficiencies. Rock phosphate should not be fed to cattle since most grades of phosphate contain a harmful substance. In case extra phosphorus is needed, the source next best to the high-protein feeds is steamed bone meal.

So far as known at present, there is no advantage to be gained through the use of complicated mineral mixtures. Moreover, their use for healthy cattle may prove harmful.

The lack of iodine in rations is shown by the presence of goiter, or " big neck," in calves at birth. Where this condition is noticed in the herd, supply the cows with iodized salt during the last 4 or 5 months before they drop their calves.

8. Preventing Vitamin Deficiencies.—Dairy cattle, like other animals, need vitamins for their growth and well-being. It is very seldom, however, that dairy cattle fed good rations suffer from a lack of vitamins.

The best sources of vitamins are fresh green, growing feeds. Hays, especially the legume hays, cured so that they retain much of their original green color, leafiness, and fragrance, are also good sources. Corn silage made from corn which was quite green at the time the silo was filled is a fair source. Good-quality grain mixtures also supply some vitamins.

Any roughage which has become badly weathered and bleached, such as hays weathered in curing, dried-up pastures, and dead corn stalks standing in the field, are poor sources.

Feeding practices, therefore, which supply dairy cattle with high-quality rations from the standpoint of palatability, digestibility, amounts of protein and minerals, etc., also supply plenty of vitamins. So far as experimental evidence goes, there is no necessity nor advantage in feeding dairy cows yeast, cod liver oil, or other commercial sources of vitamins.

COMMUNITY STUDIES

Visit a number of the best dairy herds in the community and learn as much as possible about the feeding methods employed. Use the following questions as an aid in the study:

1. What kinds of roughages are fed in winter?

2. How much hay, silage, and other roughage is fed each cow daily? Does the feeder weigh or measure any of the roughage?

3. How many times daily is roughage fed, and what is the order of feeding?

4. What is the composition of the grain mixture used? Is it suitable in protein content for supplementing the roughage?

5. Is the grain mixture weighed or measured for each cow, and is it fed in proportion to milk yield?

6. What is the rate of feeding grain mixture? How many times daily is it fed?

7. Is the owner a member of a herd improvement association? If so, what was the return over feed cost of the herd for (*a*) the previous month? (*b*) the previous year?

8. What kind of pasture is used in summer? How many acres are allowed for each cow?

9. Is pasture supplemented by feeding grain mixture, green crops, or silage? If grain mixture is used, what is its protein content?

10. Are legumes used for pasture? If so, are any precautions used to prevent bloat?

11. To what age are calves fed whole milk? Skim milk? Calf meals? Dried milk?

12. What kind of grain mixture is fed the calves? What kind of roughage?

13. What is the general plan used in feeding heifers after the milk-feeding period is past? Are the heifers confined in stalls or kept in an open shed during the winter?

14. Are the heifers well grown for their ages?

15. Describe the plan followed in feeding the herd sire. Is any pasture available for him?

16. Are any mineral mixtures, vitamin preparations, or stock tonics used, and if so, to what extent?

17. Write a report on each herd visited and point out whether you think the feeding methods employed for each class of animals in the herd are excellent, fair, or poor. Give suggestions for improving the methods used and for reducing the cost of feeding.

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NOTE. See also the references in Chapter VII.

CHAPTER IX

FEEDING BEEF CATTLE

Of all common farm animals beef cattle, perhaps, present the smallest number of technical problems of feeding. Owing to the wide range of feed materials which they can utilize, which includes almost every kind of concentrate and roughage, beef cattle will grow and thrive on a great variety of feeds. Hence there is much less tendency for them to be fed conventional or pattern rations or according to definite feeding standards than is the case with other classes of livestock. However, the very number of different feedingstuffs available makes possible a more careful and rigorous selection of feeds than is usually possible in the feeding of other animals. Economy, then, should be the keynote in the feeding of beef cattle.

Management Problems:

1. Feeding the breeding herd.
2. Feeding young calves.
3. Developing young stock cattle.
4. Fattening cattle for market.
5. Supplying salt and mineral mixtures.

1. Feeding the Breeding Herd.—One of the objects in keeping a herd of beef cows, particularly in the general farming area of the Middle West, is to make efficient use of the unmarketable roughage produced on the farm. Hence, feeds of this character should be and ordinarily are the basis for the maintenance of the breeding herd.

Considerations:

(*a*) Estimating the available by-products of the farm.
(*b*) Providing supplementary feed crops.
(*c*) Purchasing necessary commercial supplements.
(*d*) Supplying the daily ration.

(*a*) *Estimating the Available By-products of the Farm.*—In estimating the amount of pasture, hay, straw, etc., which will be available for the breeding herd, due consideration must be given to the feed requirements of other livestock. Usually it is impossible before the actual harvest to determine very closely either the yield of crops or the amounts of the different feedingstuffs which will be needed to carry certain animals over the winter and to make other animals ready for market. However, close study along this line is very important and is the only way of preventing serious feed shortages throughout the year. Knowing the acreage of the various crops and their probable yield, it is a simple matter, of course, to estimate the probable total feed supply of the farm. Deducting from these totals the feeds which will likely be needed by other farm animals will leave the quantities of the various feeds available for the breeding herd.

The second step is to decide whether or not the prospective feed supply will meet adequately the needs of the cattle. This step involves a knowledge of the daily feed requirements per animal as well as the period of time the different feeds will likely be available. Feed consumption varies according to the age and size of the animal, while the date of maturity of a crop is affected by latitude, altitude, rainfall, and the variety of the crop itself. Nevertheless, the accompanying table will be found useful in in comparing the prospective feed supply with the probable needs of the herd.

(*b*) *Providing Supplementary Feed Crops.*—Shortage of pasture or roughage supply is one of the most serious ills which can befall the breeding herd. In such event it becomes necessary to feed grain liberally, thereby increasing greatly the cost of maintenance and seriously jeopardizing any chance for

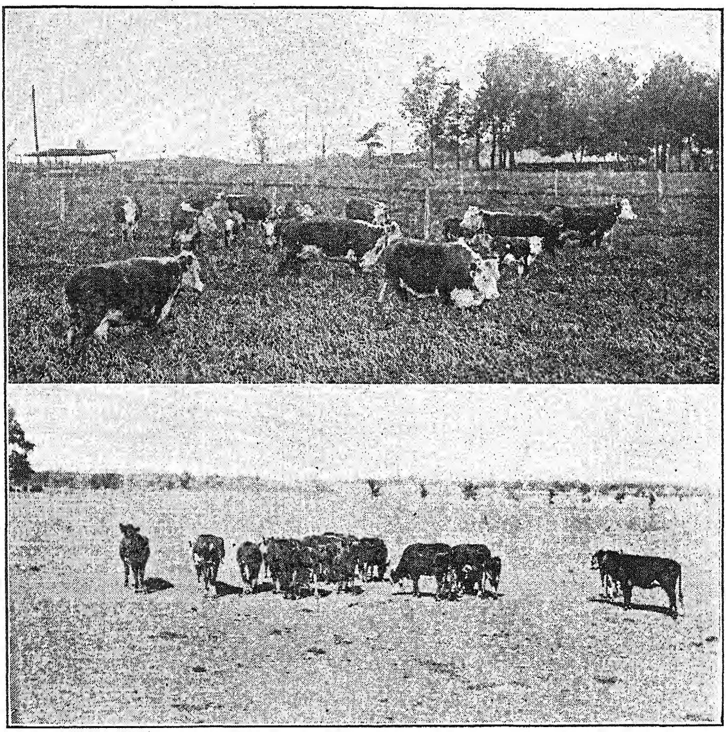
TABLE 8

FEEDS COMMONLY AVAILABLE FOR A HERD OF BEEF COWS AND AMOUNTS OF SUCH FEEDS CONSUMED PER ANIMAL

Feed	Period Available	Requirements per Cow (900–1100 Lbs.)	
		Fed Alone	Used with Other Feeds
		Per Period	*Per Period*
I. Pasture:			
1. Bluegrass........	April 20–Nov. 15	1½–3 acres	1 –2 acres
2. Mixed clovers....	May 1–Nov. 1	1 –2 acres	¾–1 acre
3. Sweet clover.....	May 1–Aug. 10	¾–1½ acre	½–¾ acre
4. Grain stubble and meadow aftermath.........	Aug. 1–Oct. 15	1½–2 acres	1 –1½ acres
5. Corn stalks......	Nov. 1–March 1	8 –10 acres	3 –5 acres
		(Per Day)	*(Per Day)*
II. Harvested Feeds:			
1. Red clover hay...	July 10–	Not recommended	4– 8 pounds
2. Alfalfa hay......	June 15–	Not recommended	3– 6 pounds
3. Soybean hay.....	Sept. 15–	Not recommended	3– 5 pounds
4. Mixed hay.......	July 20–	15–20 pounds	5–10 pounds
5. Oat straw.......	July 20–	20–25 pounds	6–12 pounds
6. Wheat straw.....	July 10–	25–30 pounds	5–15 pounds
7. Corn fodder......	Oct. 15–April 15	15–20 pounds	8–10 pounds
8. Corn stover......	Nov. 1–April 15	25–30 pounds	10–20 pounds
9. Corn silage......	Oct. 1–	40–50 pounds	20–30 pounds
10. Grain (oats, corn, etc.)..........	July 20–	Not recommended	3– 5 pounds

profit. Unless the prospective supply of rough feed and pasture is at least 20 per cent above the normal requirements of the herd, steps should be taken to provide additional crops which may be used to supplement the regular ration should drouth, insect damage, or other unfavorable circumstances make their use necessary. Crops such as red clover, sudan grass, and timothy, which may be used for either pasture or hay; and soybeans and cowpeas, which may be either made into hay or threshed for the seed, are recommended since they may otherwise be utilized if they are not needed in the maintenance of the breeding herd.

(*c*) *Purchasing Necessary Commercial Supplements.*—Except when there is an acute shortage of legume hay there is little



Courtesy of University of Illinois

FIG. 45.—THE EFFECT OF A DRY SEASON

One cow and calf per acre seemed a safe rate of stocking when grazing was begun on May 4. Yet, as a result of an unusually dry season, the pasture was entirely bare by August 15, necessitating the removal of the cattle to the dry lot. Had an emergency pasture crop, such as sudan grass, been available, the grazing period might have been extended another two months.

occasion to purchase commercial concentrates for the beef breeding herd. Cattle running on good pasture obtain sufficient protein and other nutrients to keep them in good breeding

condition; while cows and heifers fed 4 to 6 pounds per day of clover, alfalfa, or other legume hay during the winter will have their ration sufficiently well balanced for all practical purposes. However, should the failure of a clover crop make it necessary to winter the breeding herd wholly on non-leguminous roughages, such as silage, straw, and stover, from ½ to 1 pound of linseed, cottonseed, or soybean meal should be supplied daily for each animal. Larger amounts of these feeds are recommended for animals showing signs of unthriftiness, as these concentrates are rich in the important food nutrients and have a generally beneficial effect upon the digestive tract.

Wheat bran, because of its relatively high protein and phosphorus content, is a valuable feed for pregnant and nursing cows which are in a more or less rundown condition. Wheat bran also should be used in conditioning beef bulls previous to the opening of the breeding season.

(*d*) *Supplying the Daily Ration.*—During the greater part of the summer the beef herd is maintained wholly on pasture; hence the labor and other details involved in hand-feeding are absent at this time of year. Should shortage of forage during the grazing season make supplementary feeding necessary, the practice is to feed but once daily, giving silage in bunks placed in the pasture or scattering hay or green corn fodder on the ground. The amount of feed given will depend, of course, upon the condition of the pasture. Best results are obtained when the feeding of 20 to 25 pounds of silage or 6 to 8 pounds of hay per head is begun as soon as the pasture shows signs of becoming short, since to delay longer may result in an almost total lack of pasture during late summer and fall. Should grazing conditions become more unsatisfactory as the summer wears on, the amount of feed given must be increased to compensate for the smaller amount of forage furnished by the pasture area.

During the winter and such other periods as the cattle are confined in dry lot, the practice is to feed the breeding herd twice daily. In case only one kind of feed is given, it is divided

equally into morning and evening feeds. When two feeds are given, one may be fed at morning and the other at evening; or one may be fed both morning and evening and the other given near noon. Frequently a generous supply of some cheap, rather low-grade feed such as straw or corn stover is kept before the cattle at all times and a limited amount of silage or hay fed but once daily. This is the common way of feeding cows which are running in stalk fields or around straw stacks. Evening feeding is preferable to morning feeding in such cases, as the cows will spend more time foraging if they are not fed until late in the day.

As a rule no special preparation is given the feed materials supplied the breeding herd. Both the cash and feeding value of such feeds are relatively low, and labor and machinery used in making them more palatable or digestible would be almost certain to add considerably to the cost of wintering. If facilities for grinding are available on the farm, ear corn and oats when fed may be ground and mixed with the silage, thereby insuring a more even consumption of these feeds than would likely occur if they were fed whole. Also, corn fodder may be shredded if shredding makes possible better storage facilities and reduces the labor of feeding to a considerable extent.

2. Feeding Young Calves.—Previous to the advent of the present market popularity of lightweight cattle there was little occasion for the grain feeding of young beef calves. Since cattle were usually marketed at from 2 to 3 years of age, mothers' milk and grass were deemed sufficient for the first 6 or 7 months of the young animals' existence and grass or harvested roughage alone thereafter. However, the growing demand for baby beef frequently gives rise to the feeding of grain to young calves during the nursing period and selling the animals at around 10 months of age when weighing about 650 or 700 pounds. Such a plan of feeding and management has many advantages, especially for the small farmer who has neither the feed nor equipment to keep a large number of animals over the winter.

Considerations:

(*a*) Providing feeding equipment.
(*b*) Selecting suitable feeds.
(*c*) Supplying the daily ration.
(*d*) Feeding after weaning.

(*a*) *Providing Feeding Equipment.*—Two general plans are in use in the feeding of young calves. One involves the separation of cows and calves during a part of the day, during which

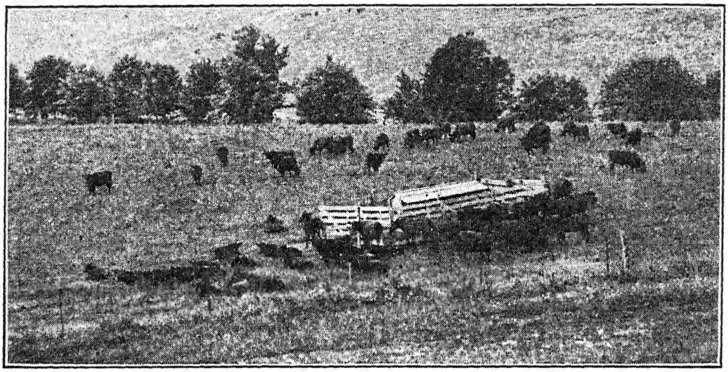


Photo by Hildebrand *Courtesy of Briarcliffe Farms*

FIG. 46.—A WELL-CONSTRUCTED CALF CREEP

This creep is large enough to accommodate forty or fifty calves. Note that the roof of the hopper extends out over the troughs to protect the feed from rain.

time the calves may eat the grain given them without molestation by the cows. In some cases the calves are with the cows only a few minutes each morning and evening to nurse; in other cases, they are with the cows during the night but are kept in a well-shaded paddock or darkened barn during the day, where they may have shelter from the flies and heat. Whichever way they are handled they are usually fed in the troughs or bunks which are part of the regular winter feeding equipment, modified, if necessary, to permit its use by very small animals.

In the second and more common plan of feeding, the calves

run with their mothers and are fed in pen-like enclosures called "creeps," which exclude the cows but permit the entrance of the calves. In the case of cattle running on pasture, these creeps are built near the water supply or under shade which is frequented by the herd. Thus the calves are induced to enter the creep two or three times daily and eat as much as they will of the feed given them. Where feeding is done in an open pasture a covered trough should be used to prevent the feed from being damaged by rain before it is consumed. A small self-feeder set with the exposed trough to the north or east is very satisfactory. Such a feeder is shown in Fig. 46.

(b) *Selecting Suitable Feeds.*—Simple rations composed largely of sound, wholesome farm-grown grains are recommended for nursing calves. Since in the majority of cases the protein needed for growth will be furnished by the mother's milk, a protein concentrate is seldom necessary until near weaning time. Calves which run with their mothers on pasture or which have access to grass in orchards or paddocks near the barn have little need for additional roughage. However, calves which are confined in bars or dry lots should be fed a small amount of choice legume or mixed hay. Coarse roughages such as stover, straw, or even corn silage should not be fed, as small calves usually get from their mothers' rations as much of these materials as their small digestive systems can handle safely.

(c) *Supplying the Daily Ration.*—Nursing calves usually begin nibbling at feeds when about three weeks of age. Even before this time they will acquire the habit of entering a well-bedded creep which affords much greater comfort than the main shed housing the rest of the herd. Grain placed in a low trough erected in such a creep will be "nosed over" by the more inquisitive youngsters and they will soon discover that the attractive grains of yellow corn are good to eat. Whereupon the more backward calves will crowd up and copy the actions of their bolder mates. Occasionally, calves which have not been taught to eat before being turned on pasture

will not enter the creep erected for them. Should they persist in their shyness, an older calf with a well-developed appetite for grain should be turned with them for a few days.

Ground corn has little advantage over shelled corn for young calves. In fact, most calves prefer the whole corn, as they seem to enjoy cracking the grains between their teeth. Also, shelled corn is not so badly damaged as ground corn when exposed to damp and inclement weather. Oats may be fed either whole or ground, but both wheat and barley should be coarsely ground, as the kernels of these grains are too hard to be chewed easily.

Young calves which are fed in open troughs are usually fed once daily. Feed which remains uneaten for any length of time soon becomes unpalatable; hence any unconsumed feed should be removed at the time of the next feeding. Self-feeders, when used, should be completely cleaned out and refilled at least once a week to guard against disagreeable odors resulting from musty or spoiled feed.

Perhaps the most common grain ration fed young calves is equal parts by measure of shelled corn and whole oats. Another popular mixture is 7 or 8 parts by weight of shelled or coarsely ground corn and 1 part of linseed or cottonseed meal. Still another common ration, especially among the owners of purebred herds, is 3 parts by weight of ground corn, 3 parts of ground barley, 2 parts of ground oats, 1 part of bran, and 1 part of linseed meal. Almost any reasonable combination of the ordinary concentrates will prove satisfactory provided all the ingredients are of good quality and free from objectionable flavors and odors.

(*d*) *Feeding after Weaning.*—For young calves intended for marketing at from 8 to 12 months of age, weaning simply marks the occasion for an increased consumption of feeds during the 2 to 4 months which remain before they are marketed. Since weaning usually is accomplished by removing the calves from pasture to the dry lot, it will call for the feeding of a little roughage in the form of hay. Good-quality legume hay

that is leafy and free from dust and mold should be procured for such calves if possible. Two or 3 pounds per head per day will be sufficient. Owing to their simultaneous removal from milk and fresh pasture, young calves are likely to need more protein concentrate immediately following weaning than during mid-summer. However, 1 pound of linseed, cottonseed, or soybean meal per head per day will be adequate, provided additional protein be secured from legume hay.

3. Developing Young Stock Cattle.—The term "stock cattle" is applied to animals which are not to be fattened immediately, but are allowed to grow for awhile before being put in the feed lot or assigned to the breeding herd. Inasmuch as the principal object in maintaining "stockers" is the utilization of coarse feeds which will suffice for growth but not produce appreciable fat, their ration will consist largely of pasture and roughage. In this respect their feeding is much like that of the breeding herd. However, owing to their youthful age and heavy growth requirements their ration must be somewhat better both in quality and quantity than that of mature breeding animals.

Considerations:

(*a*) Feeding during the pasture season.
(*b*) Feeding during the winter season.

(*a*) *Feeding during the Pasture Season.*—Except during the winter months stock cattle are usually carried on pasture. Not only is green pasture forage nutritious, but it is particularly rich in protein and vitamins which are essential for proper growth and development. Pasture used by young animals should not be heavily stocked unless provision has been made for supplementary feeding in case the supply of grass becomes short. In many instances providing a half feed of silage during the latter part of the summer, when heat and flies interfere with grazing, will be advantageous even though some grass is still available.

Corn-stalk pasture is not satisfactory for young cattle unless

supplemented with rather generous supplies of other feeds having greater nutritive value. Stockers should not be left in a field of fresh stalks more than a few hours each day until most of the corn escaping the huskers has been eaten. Neither should young cattle be kept in a stalk field until the stalks are picked clean of leaves. Rather they should be removed to a

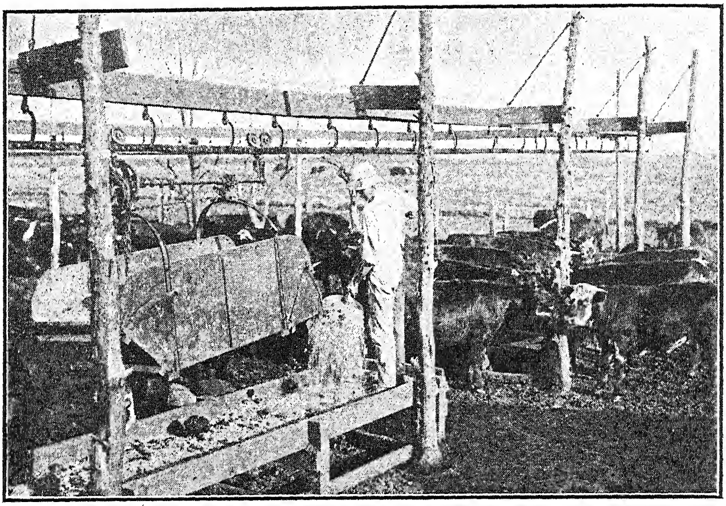


FIG. 47.—CONVENIENT FEEDING EQUIPMENT

The large, home-made hopper is well suited for transporting bulky feeds such as ear-corn and silage from the crib or silo directly to the feed trough. Thus, the chore of feeding is greatly lessened.

fresh field or to the dry lot and older animals used to glean the forage which remains.

(*b*) *Feeding during the Winter Season.*—Corn or sorghum silage is the best all-round feed for stock cattle during the winter period. Its palatable, succulent nature insures its ready consumption and makes for the condition of thrift which accompanies a well-regulated digestive tract. However, silage is low in protein and consequently should be accompanied with either legume hay or a protein concentrate. Four to 6 pounds

of such hay or 1 to 1½ pounds of nitrogenous supplement per head daily will furnish the additional protein needed to insure normal growth and development.

Where sufficient silage is available to permit a full ration, the feeding of grain will not likely be justified. Should silage be limited to a marked extent or altogether omitted from the ration, some grain will probably be needed, especially by the younger animals and those which for one reason or another are somewhat small or unthrifty. Oats is a very satisfactory grain for young stock because of its growth-promoting qualities. Fed either as sheaf oats or as the threshed grain, it constitutes an economical and efficient supplement for such roughages as stover, straw, and mixed hay. Corn-and-cob meal is a very satisfactory concentrate for young stock catttle. The presence of the cob particles imparts bulk to the ration and by prolonging the period of eating makes more certain that all animals share equally in the amount of grain fed. Other grains such as barley, wheat, and the various varieties of grain sorghum may be substituted for corn and oats with good results. However, these grains, because of their small hard kernels, must usually be ground before being fed.

The amount of grain fed to young stock cattle during the winter period will depend, of course, upon the amount and quality of the other feeds fed and upon the general condition of the animals themselves. As a rule the amount will vary from ¼ to ½ a full ration, or from 3 to 5 pounds per head daily in the case of calves and from 4 to 6 pounds in the case of yearling cattle. Larger amounts are not recommended as more liberal grain feeding will be likely to bring the cattle through the winter with too much flesh to permit their efficient use of pasture during the following spring and summer.

4. Fattening Cattle for Market.—The feeding of cattle for market is confined largely to the corn-belt states, where corn and other concentrates are available in large quantities and at low prices. In addition to the corn belt, other regions, such as the sugar-beet-producing areas of Colorado and Michigan,

and the tobacco-growing sections of Wisconsin, Pennsylvania, and Kentucky, finish considerable numbers of cattle. In the sugar-beet areas cattle are kept to utilize the tops and pulp of the sugar beets, while in the tobacco sections they are fed primarily to secure large quantities of animal fertilizer for the tobacco fields. Even in the corn belt cattle feeding is seldom carried on as an enterprise apart from farming. Instead it is undertaken in order to realize more than market prices for farm-grown grains and to secure something in the way of revenue for otherwise useless pasture and roughage.

Considerations:

(*a*) Inventorying available feed supplies.
(*b*) Choosing the grain ration for fattening cattle.
(*c*) Feeding roughages to fattening cattle.
(*d*) Feeding protein concentrates.
(*e*) Feeding mineral supplements.
(*f*) Preparing the feeds.
(*g*) Starting cattle on full feed.

(*a*) *Inventorying Available Feed Supplies.*—Stress has already been put on the importance of estimating carefully the available feed supply before embarking on a beef-cattle feeding enterprise (see page 39). On no occasion is this step of greater concern than in undertaking to fatten a drove of steers. Until this step is accomplished it will be impossible for the feeder to know either what kind of cattle he is best equipped to feed or how many animals he may buy with fair prospects of carrying them to a satisfactory market finish. The accompanying table presents in a general way the daily and total feed requirements of the more common classes of cattle which are fed for the open market.

(*b*) *Choosing the Grain Ration for Fattening Cattle.—Corn* is the standard grain feed for fattening cattle. In fact, comparatively little cattle feeding is done outside of that section of the United States known as the corn belt, which is testimony that from the standpoint of both cost and efficiency no other

TABLE 9

FEED REQUIREMENTS OF FATTENING CATTLE

Description of Cattle	Approximate Initial Weight	Approximate Time Fed	Ration Fed	Probable Daily Feed Consumption	Reasonable Feed Allowance per Head for Usual Fattening Period
	Pounds	*Days*		*Pounds*	*Pounds*
I. Two-year-old steers.	900	140	Grain........	15	2,000
			Nitrogen concentrate....	.75	100
			Dry roughage..	10	1,500
			Grain........	12	1,700
			N. conc.......	1.25	175
			Dry roughage..	4	600
			Silage........	25	3,500
			Grain........	......	.....
			N. conc.......	1.50	200
			Dry roughage..	4	600
			Silage........	55	7,500
			Grain........	17	2,400
			N. conc.......	.50	75
			Pasture.......	1 *Acre*	1 *Acre*
				Pounds	*Pounds*
	1,100	80	Grain........	20	1,600
			N. conc.......	2	150
			Dry roughage..	6	700
II. Yearling steers.	650	160	Grain........	14	2,200
			N. conc.......	1	150
			Dry roughage..	6	1,000
			Grain........	11	1,800
			N. conc.......	1.25	200
			Dry roughage..	3	500
			Silage........	15	2,500
			Grain........	......	.....
			N. conc.......	2	300
			Dry roughage..	3	500
			Silage........	40	6,500
	600	180	Grain........	13	2,400
			N. conc.......	1	175
			Pasture.......	1 *Acre*	.66 *Acre*
				Pounds	*Pounds*
III. Calves.	425	220	Grain........	11	2,500
			N. conc.......	1	225
			Dry roughage..	5	1,100
			Grain........	9	2,000
			N. conc.......	1.5	300
			Dry roughage..	2	500
			Silage........	10	2,000

grain competes seriously with corn as a cattle feed. In palatability, ease of preparation, and flesh-producing qualities corn may be said to surpass all other farm-grown grains.

Large amounts of *barley* are used in cattle feeding in the northwestern states and in Canada. Because of the firm, even flesh usually possessed by barley-fed cattle this grain is held in high esteem by cattle feeders. However, barley is somewhat less fattening than corn and as a rule the gains produced by it are slightly lower. Barley grains are small in size and hard in texture; consequently barley should always be ground before being fed. This cost of preparation, together with the fact that in most of the cattle-feeding sections of the country barley is commonly higher in price than corn, usually makes barley the more expensive feed.

Oats have been used more and more extensively in cattle-feeding since the curtailed demand for oats for feeding horses has resulted in extremely low prices for this grain. Oats are too bulky to be fed alone successfully except possibly to mature cattle, which have ample digestive capacity to eat a sufficient quantity to insure good gains. During the early part of the feeding period oats may constitute as much as one-half or even two-thirds of the ration, but if fed in such large amounts they should be gradually replaced by corn or barley as the feeding period progresses. Oats, like barley, should be ground for fattening cattle, as when fed whole they are swallowed without being well chewed.

Wheat has only recently come into prominence as a cattle feed, as before 1930 it usually was too high in price to justify its use for this purpose. Wheat is comparable with corn in chemical composition and nutritive value but is less palatable, owing to its sticky, pasty consistency when chewed and mixed with saliva. When combined with corn or oats, wheat gives much better results than when fed alone. As the kernels of wheat are small and hard they should be ground before being fed.

In the semi-arid region of the southwestern states large

areas are planted to different varieties of *grain sorghum* to be used in beef-cattle production. While most of this grain sorghum is fed in the form of fodder and silage to breeding herds and stock cattle, an appreciable quantity of the threshed grain is used in fattening steers for market. In general, the grain sorghums have proved to be a very satisfactory concentrate for cattle in those states where the hot, dry climate is unfavorable for the growth of corn.

The decision as to what grain ration to feed will depend, of course, upon the relative market price of the different grains and upon the grinding facilities available. Since, from the standpoint of the cattle, corn is the equal of all other feeds, if in fact it is not superior to them, grains other than corn will be considered seriously only when their market prices are sufficiently below that of corn to make possible a real saving from their use. Account must also be taken of the cost of grinding such feeds as barley and wheat and of the extra labor involved in weighing, mixing, and feeding two or three feeds rather than one.

(*c*) *Feeding Roughages to Fattening Cattle.*—Roughage is important in the ration of fattening cattle not only for the food nutrients contained therein but also because of the aid given to the digestive process through the addition of bulk to the food mass. Attempts to fatten cattle upon an exclusive grain diet have proved unsuccessful. Animals so fed have shown unmistakable symptoms of digestive disorders and have acquired an unthrifty appearance.

Much variation exists in the kinds and amount of roughage material fed to fattening cattle. If possible, the roughage should be palatable and of good quality. Clover and alfalfa hays are excellent roughages and are much to be preferred to non-legume hays, stover, or straw. Corn silage is a very satisfactory roughage material, inasmuch as its succulent nature makes for a wholesome condition of the digestive tract. However, corn silage is very bulky, and hence should be limited to some extent if the most rapid gains are to be realized. This

is particularly true in the case of calves which, if fed a full feed of good corn silage, will often eat so much as to reduce their consumption of grain below that necessary to insure good gains.

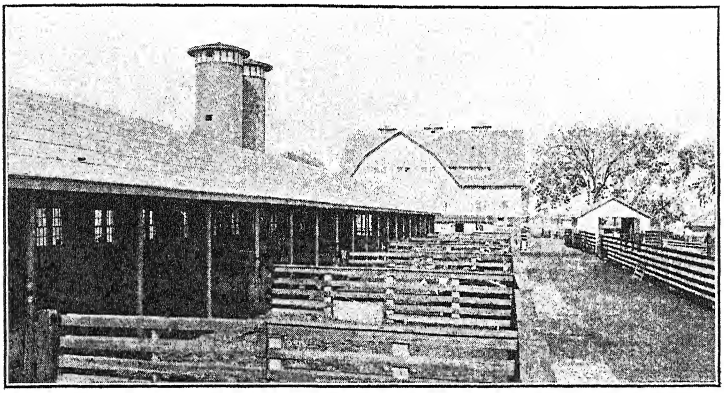
Chief among all roughage materials for fattening cattle is pasture, especially bluegrass and red-clover pasture. Where summer feeding on pasture is practiced little if any roughage other than the pasture forage is required. However, should the pasture become short and dry, some harvested roughage, such as corn silage or legume hay, should be supplied. Some feeders keep a rack of mixed hay or oat straw within easy reach of the cattle, believing that the small amount of such dry roughage eaten will tend to counteract the laxative effect of the pasture.

(*d*) *Feeding Protein Concentrates.*—Inasmuch as all the common farm-grown feeds except the legume hays are low in protein, it is usually necessary to feed a nitrogenous concentrate to fattening cattle to achieve a balanced ration. Failure to use such feed when it is needed is perhaps the most common mistake made by inexperienced feeders. The penalty suffered from this error is likely to be slow gains and a lack of that finish and thrift which makes for ready demand on the part of market buyers.

The protein feeds most commonly used in beef-cattle feeding are cottonseed meal, linseed meal, soybean meal, and corn gluten meal. Of these materials linseed meal is usually held in highest repute by experienced feeders, chiefly because of its mild laxative properties which tend to promote a healthful condition of the digestive tract. Also, linseed meal is believed to impart a sleek, glossy coat of hair which enhances the sale value of the finished animals. However, the protein content of linseed meal is less than that of cottonseed and soybean meal, so that, theoretically at least, somewhat larger amounts must be fed to furnish the same quantity of protein. Perhaps from the standpoint of the practical feeder the cost per pound of protein should be the chief factor to consider in the purchase of a protein concentrate. Hence, note should always be made

of the guaranteed protein content printed on the label or bag.

The amount of protein concentrate to feed to cattle will depend both upon the amount of legume hay being fed and upon the age and weight of the cattle. As a rule, cattle fed all the clover or alfalfa hay they will eat receive sufficient protein from that source and hence have no need for feeds such as linseed or cottonseed meal. In the case of calves, should the



Courtesy of University of Illinois

FIG. 48.—EXPERIMENTAL CATTLE-FEEDING LOTS

Much valuable information pertaining to the feeding of livestock is ascertained by the various agricultural experiment stations. Feeders should keep in close touch with the work being done at their own state institutions.

consumption of hay fall to below 5 or 6 pounds per head or to approximately 1 pound per hundredweight, the addition of 1 pound of protein concentrate per 1000 live weight daily will likely be advisable.

Cattle fed no legume hay will require from 1 to 3 pounds of protein concentrate per head daily, depending upon the age and weight of the animals. Young cattle require larger amounts than old animals in proportion to their weight because of their demand for protein for growth and development.

Despite numerous experiments which have been conducted to ascertain the protein requirements of cattle, no agreement has been reached by investigators as to what these requirements really are. If, as seems rather probable, the requirement per hundredweight is essentially inversely proportional to the age and weight of the animal, we arrive at the conclusion that the amount of protein required per head daily is approximately the same regardless of the age or weight of the animals. Thus the following jingle will serve as a practical guide in feeding the common nitrogenous concentrates to fattening cattle:

"To cattle fed no legume hay
Give 2 pounds of oil meal per day.
For each 4 pounds of clover fed
Deduct 1 pound of meal per head."

(e) *Feeding Mineral Supplements.*—Much controversy exists as to the need of fattening cattle for special mineral supplements. However, many data are at hand indicating that where cattle are fed a variety of feeds in such proportion as to make a fairly well-balanced ration, no mineral supplement is needed. Calcium and phosphorus, the two elements most likely to be inadequately supplied, are present in alfalfa and clover hay, while all protein concentrates are relatively high in phosporus. Should it be impossible to feed legume hay and protein concentrates in such quantities as would seem to supply the amount of minerals needed, a mineral supplement consisting of 4 parts of bone meal and 1 part of common salt should be kept within reach of the cattle.

Fattening cattle have even more need for salt than breeding cattle since they consume less roughage, which is much higher in minerals than grains. Hence, they should have free access to salt at all times or be fed a small quantity two or three times per week.

(f) *Preparing the Feeds.*—Feeds used in the fattening of cattle are seldom subjected to any elaborate method of preparation. Instead they are fed in the simple form in which they

come from the field, or are modified only enough to permit their ready consumption. Numerous experiments have demonstrated that either shelled or broken ear corn is as satisfactory as ground corn for mature steers under ordinary conditions, and that shelled corn is the equal of ground corn for calves where hogs are available to salvage the undigested corn. Usually it is advisable to grind ear corn for calves; however, shelling is better than grinding because it can be done with less cost and the cobs do not occupy digestive capacity which should be used by more valuable feeds.

Roughages should be fed in their natural state without cutting, shredding, or grinding. While it is possible to reduce the amount of roughage refused or wasted by grinding or chaffing, it is doubtful if any real benefit results, as such preparation requires the animal to consume the less valuable woody parts of the plant with the more palatable and nutritious portions. Even though grinding hay or stover may result in a saving of 15 to 20 per cent of the material fed, such saving is not likely to exceed the machinery and labor costs with roughages at ordinary farm prices.

(*g*) *Starting Cattle on Full Feed.*—Some care must be exercised in accustoming cattle to a heavy grain ration else some of the animals may eat more than is good for them and go "off feed." In extreme cases over-eating before getting adjusted to a full feed may result in "founder," a digestive disturbance characterized by severe lameness from which the animal seldom recovers.

Occasionally, cattle which have never been fed corn are slow to begin eating it. In such cases the amount of corn fed must be greatly limited until all the animals consume it readily, else some of the more forward cattle will eat too much. Corn silage, containing as it does corn in highly diluted form, is an excellent means for accustoming cattle to corn. By gradually mixing additional shelled corn with the silage the cattle are brought up to almost a full ration without any abrupt change in their feed. Green corn fed "stalk and all" is another good

way to begin feeding corn to cattle which have just been consigned to the feed lot. Ground or broken ear corn is a much safer feed than shelled corn for the first month or two of the feeding period, as the cobs serve to dilute the grain and make for a smaller consumption of total nutrients.

A good working rule for bringing calves up to a full feed, which with some modifications can be used with older cattle, is as follows:

> In starting cattle on full feed
> Silage and hay is all they need.
> On the fifth day begin to pour
> Two pounds of grain per head, not more.
> Increase by one pound each third day
> Until they stand or walk away.
> Now cut the roughage 10 per cent
> And when another week is spent
> Increase the grain by half a pound;
> Then let another week go round
> Before you try another time
> To make your cattle fat and prime.

5. Supplying Salt and Mineral Mixtures.—Salt is usually fed cattle according to appetite. Cattle on grass or other green feed consume nearly $\frac{1}{10}$ of a pound of salt per head per day, or 3 pounds per month. Animals fed dry feed, however, consume only about one-fourth this amount. If the flake or barrel form of salt be used, it should be kept under cover where it will not be leached by rain. However, the block form of salt may be put in the open without appreciable loss. In the absence of feed bunks in the pasture, special boxes should be provided to keep the salt from becoming soiled and less palatable than when fresh and clean.

Beef cattle have little need for special mineral feeds when fed some nitrogenous concentrate and plenty of wholesome farm roughages which include legume hays. As stated in a previous chapter, these feeds furnish calcium and phosphorus, the two mineral elements which are most likely to be needed by

cattle suffering from mineral deficiencies. Should a lack of sufficient minerals be suspected, a mixture of 4 parts bone meal and 1 part salt should be kept within free access of the cattle.

FARM AND COMMUNITY STUDIES

1. Let each student prepare an inventory of the feed supplies on his home farm not used by other livestock which might be used in maintaining beef cows.

2. Estimate the number of cows this feed would carry during the period it is in good condition for feeding.

3. What feed crops would you recommend to bridge over the periods for which present feed supplies are inadequate?

4. Prepare a calendar showing the yearly feed schedule followed in maintaining a herd of beef cows on an actual farm in your locality.

5. What changes or modifications would you recommend to make for greater economy and efficiency?

6. Visit a farm where the creep feeding of nursing calves is practiced and interview the farmer to obtain his estimate of the value of such feeding. Compare such calves with similar calves which are not thus fed.

7. Make a census of 4 or 5 cattle feeding farms of the community to learn (*a*) the kind of cattle usually fed; (*b*) the rations used; (*c*) the length of the feeding period, and (*d*) the increase in weight realized.

8. On the basis of the above data calculate for the feeders of your locality (*a*) the average daily gain realized; (*b*) the cost per hundred pounds gain, and (*c*) the total feed cost per steer fed.

9. Does there appear to be any relation between the use of protein feeds and the general care exercised in the management of the herd among the cattle feeders whom you know?

10. Obtain tags and labels from the various commercial cattle feeds and protein supplements used in your locality and compare these feeds as to guaranteed composition and price per ton.

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U.S.D.A. Farmers' Bulletins: No. 1382, Fattening steers in the corn belt; No. 1416, Fattening beef calves; No. 1549, Feeding cattle for beef.

NOTE. See also the references in Chapter VII.

CHAPTER X

FEEDING AND EXERCISING HORSES

Horse feeding, in some respects, differs markedly from the feeding of other classes of farm livestock. Usually the same individuals are fed over longer periods of time than is the case with meat animals. In fact, carefully fed farm horses are sometimes still being kept in service when they have reached the advanced age of twenty years or even a little beyond. Horse feeding is not usually a market-fattening proposition although such a practice is desirable at times. For the most part horses are fed for their present or prospective use as motors; their work as such involves great strain at times, both physical and mental. The feeding of horses also differs from the feeding of other classes of stock in that horses vary more widely in individual temperaments than do other farm animals. Mistakes in feeding them are much more frequently penalized by acute indigestion and sudden death.

The horse is not so efficient as are the ruminants in digesting fiber, particularly those roughages which are low in feeding value. However, considerable quantities of the cheap coarse roughages can be successfully used provided they are sound. Good pasture is especially desirable. In addition, working, breeding, and growing horses usually require some grain, the amount depending upon the quality and kind of roughage being used with it. Moldy, musty, dusty, or otherwise damaged feeds are likely to cause serious digestive trouble.

Management Problems:

1. Selecting suitable feeds.
2. Preparing the feeds.

3. Watering and salting.
4. Feeding farm work horses.
5. Fattening and exercising draft horses for market and show.
6. Feeding and exercising pleasure horses.
7. Feeding and exercising the breeding stallion.
8. Feeding and exercising the brood-mare and foal.
9. Feeding and developing yearlings, twos, and three-year-olds.

1. Selecting Suitable Feeds.—There is considerable range in the selection of common feeds suitable for horses.

Considerations:

(*a*) Non-leguminous hays.
(*b*) Legume hays.
(*c*) Grains.
(*d*) By-product feeds.
(*e*) Pasture and other succulent feeds.

(*a*) *Non-leguminous Hays.*—Hays of this class are usually sound and seldom cause digestive, or wind, troubles. They are safely fed according to appetite to the idle horse and are suitable for the hard-worked horse which is getting a heavy grain ration. A ration composed entirely of non-leguminous hay and the grains ordinarily fed to horses is too wide in nutritive ratio, particularly for growing or breeding horses, to be satisfactory over any considerable period of time. To avoid this difficulty legume hay should be substituted for a portion of the non-leguminous hay or some protein concentrate should be added to the grain ration.

Timothy hay is the most widely used non-leguminous hay for feeding horses. It is the favorite for light horses which are used at fast paces. It is good hot-weather hay for the hard-worked draft horse. *Brome grass, prairie,* and *orchard grass* hays may be substituted for timothy.

Corn or *sorghum* seed thickly planted makes a big tonnage per acre of useful winter roughage for horses. *Corn stover, corn fodder,* and *sorghum* are suitable for feeding on pasture;

shredded stover is more easily fed in the barn and the refuse makes ideal bedding which is easily handled.

In the corn belt much use, too much in fact, is made of cornfields, after the corn is husked, for pasturing idle horses. This is a safe practice when fall weather permits the stalks to cure out normally. Rotten, moldy stalks, however, are not a safe feed and during some years many horses have died from "cornstalk disease," because they were forced to subsist on such rations. Even with stalk fields in good condition, an evening feed of legume hay does much to improve the ration.

Oat straw is the most valuable straw for horse feeding and is well suited to make up an important part of the winter roughage ration for mature, idle, or lightly-worked horses. Horses running on rank-growing sweet clover will relish small amounts of dry straw, even wheat straw.

(*b*) *Legume Hays.*—A wider use of legume hays in horse rations offers an excellent opportunity to improve and frequently to cheapen the rations for all horses except those doing their work at a fast pace. Their use for farm horses fits in well with the crop rotations regarded most highly from the standpoint of soil fertility and farm management. Since legume hays are rich in nutrients and very palatable, harm may result from feeding them too generously to horses, even when of good quality. When they are of low quality, owing to damage in making or storing, they are very unsafe horse hays. Cheapest, safest, and generally most satisfactory results are to be had when legume hays are fed in amounts making up one-third to one-half of the total daily roughage ration. The remainder of the roughage should be a non-leguminous hay or straw. This statement applies to all the legume hays and to practically all classes of horses. Legume hays cut down grain requirements and practically eliminate the necessity for feeding purchased protein concentrates to farm horses. They are laxative in character.

Alfalfa makes an excellent hay for horse feeding. The first cutting, when it is soundly cured, is usually the most

suitable for this purpose. The fact that it is coarser stemmed and not so leafy offers certain advantages. The very leafy, choice, pea-green hay, unless fed in limited quantities, is likely to cause horses to scour and for this reason it is not at all suitable for the very hard-worked horse. Alfalfa hay is a very satisfactory bone and muscle builder when fed to colts, as it is particularly rich in lime. In small amounts it is valuable for breeding horses.

Red clover is another of the lime-laden legumes. It is only a little less valuable for horses than alfalfa, the difference depending mostly upon the grades of the two kinds of hay. *Mixed clover and timothy* is a favorite hay for "all-around" use. *Mixed alsike and timothy* is also very highly rated by those who have used it.

Soybean hay when fed experimentally to growing colts has been practically as efficient pound per pound as alfalfa. There are farms in central Illinois where horses have been grown and worked for several years on soybean hay in combination with grains. The oil in the beans tends to make a glossy coat. Hay containing too many beans will cause scouring. With favorable fall weather for curing, soybean straw makes good roughage for idle horses.

(*c*) *Grains.*—While idle and lightly used horses may be maintained in good condition on hay alone, provided it is of good quality, all horses doing medium and hard work require grain feeding. Without it the muscles become weak and wasted and the animal is low-spirited. Home-grown grains and roughages may be depended on to keep work horses in good condition. The feeding, however, must be skillfully done; overfeeding, underfeeding, or irregular feeding will result in unnecessary sickness and wasted expense for keep.

Oats are regarded more highly than any other grain for all classes of horses. Sound oats of standard weight or heavier are very palatable, nutritious, and bulky enough, because of the hull, to make a very safe feed. They are particularly adapted to breeding stock, growing colts, horses which are

being worked at fast paces, and to hard-worked draft horses during hot weather. Old oats are preferred to new. Sheaf oats, properly cured and stored, make horse feed which is highly appreciated by many experienced horsemen. They furnish both grain and roughage and when fed in this way the cost of threshing is eliminated.

Sound *ear corn* is a standard grain feed for farm horses in the corn belt. It keeps better than shelled corn and it is eaten more slowly. As a source of energy corn is considerably superior to oats pound per pound. Oats one-half and ear corn one-half, by weight, make a good combination. When corn is the sole grain fed, it is necessary to include a portion, one-third to one-half, of legume hay in the ration. Lacking this, some protein concentrate should be fed with the corn.

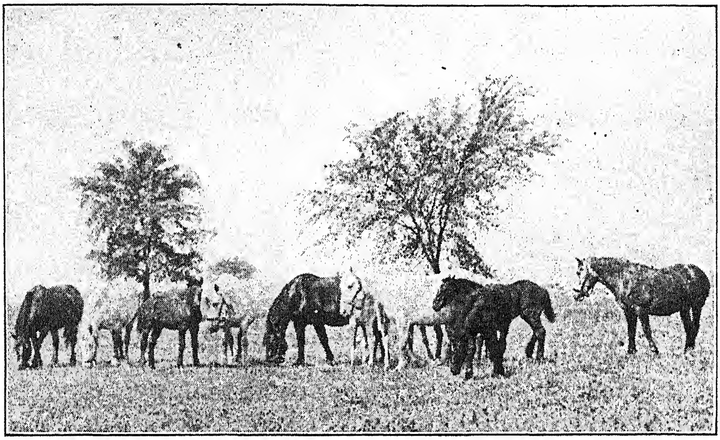
Barley, ground or preferably crushed, is a safe and suitable feed for horses. *Ground wheat* or *rye* is sometimes used to make up a small portion (3 or 4 pounds) of the daily grain ration of horses. They cannot safely be fed in large quantities and should always be mixed with lighter feeds.

(*d*) *By-product Feeds.*—*Wheat bran* is widely used and very highly regarded by experienced horse feeders as a protein concentrate. Because of its high mineral content, particularly of phosphorus, it is especially adapted to growing and breeding animals. It may be said to be a necessary part of the grain ration of horses which are not being fed any legume hay nor being run to grass. For growing heavy, quality bone in young horses, the combination of a liberal portion of bran in the grain ration and of legume hay in the roughage part of the ration supplies both the necessary phosphorus and the lime. Dry bran mixed with the grain causes the horse to eat more slowly. In addition, bran is desirable because of its bulk and laxative qualities. Wet bran is especially laxative.

For horses being fed a non-leguminous hay, bran may well make up one-fifth by weight of the daily grain ration. Hard-worked horses which are receiving a heavy grain feed are benefited by a twice-weekly bran mash instead of the regular evening

grain feed. To make the mash, take 2 to 4 pounds of bran in a pail, add a tablespoonful of salt and enough water to make the bran wet but crumbly. In winter, use hot water, cover the pail with a gunny sack, and let it steam until cool enough to feed. Bran mashes are very suitable for horses which are sick or convalescent.

Linseed meal is a good protein concentrate but it is less widely used for horses than bran. It is a healthful, laxative



Courtesy of University of Illinois

FIG. 49.—AN ABUNDANCE OF FRESH, CLEAN PASTURE KEEPS BREEDING ANIMALS HEALTHY

Percheron brood-mares and their lusty foals on permanent bluegrass pasture.

feed. When fed to horses receiving a non-leguminous hay, it usually is not too laxative if it does not exceed 10 per cent by weight of the daily grain ration; 1 to 2 pounds per day is ordinarily the upper limit in amount fed. Fed to horses which have been poorly wintered on coarse, dry feeds it adds to their thrift and hastens the shedding of the old hair.

(*e*) *Pasture and Other Succulent Feeds.*—Pasture is absolutely necessary for the growing of useful, sound horses. It

reduces the cost of both feed and labor and at the same time increases the health of mature horses. Hence, the economical management of farm horses involves the wide use of pasture. As stated in Chaper XIII, the best combination in many sections is a bluegrass or other permanent grass pasture for spring, fall, and at least a portion of the winter, and a pasture of mixed grasses and clover in the rotation. Sweet clover, wherever the ground contains sufficient calcium to grow it, should form an important part of the rotation-pasture mixture.

Soundly preserved *silage* which has been made from properly matured corn plants is occasionally used for feeding idle horses. Usually not more than 12 to 15 pounds are fed daily. Silage which has molded either in the silo or after it has been removed is a very dangerous horse feed; frequently it is a horse-killer.

2. Preparing the Feeds.

Methods:

(*a*) Grinding.
(*b*) Dampening and soaking.

(*a*) *Grinding.*—Available experimental evidence seems to show that when farm horses have sound teeth the extra expense of grinding the ordinary grains or cutting the hay which is fed to them does not pay in feed saved. There are a few exceptions to this general statement. Barley should be ground, or preferably rolled, before feeding. Rye and wheat, occasionally fed in small quantities to horses, require grinding. Oats which have been crushed or rolled make a light, bulky feed highly regarded by many expert fitters. Oats thus prepared are preferable to whole oats when fed to show colts which are running on lush pastures, as much less of the grain passes through the system undigested.

Cut hay is sometimes mixed with ground grain. This mass when dampened with molasses and water or water alone makes a palatable, bulky feed which is eaten more slowly than grain

alone. Fitters of draft horses for show or sale rather frequently follow this plan of feeding, but it is seldom practiced in work-horse barns.

(*b*) *Dampening and Soaking.*—Grain is mostly fed dry, with the exception of the weekly or twice-weekly laxative bran mash which is fed in the place of the evening grain feed. Also, old, hard ear corn is sometimes soaked between feeds in order that it may be more easily masticated. All moistened feeds require some extra labor in their preparation and increased precaution to prevent spoilage.

3. Watering and Salting.—No kindly disposed caretaker permits his charges ever to lack for either water or salt.

Watering.—Horses on pasture should have access to water at all times. Colts, particularly, are benefited by having access to water even when they are stabled. Work horses should be watered before feeding and again after feeding as they pass the water tank on the way to work. During extremely hot weather extra waterings in the field help to prevent over-heating. If watered frequently they will not take too much at any one time. Stabled horses greatly appreciate a drink when the last rounds of the stable are made at 8 or 9 o'clock at night. They have finished eating and the drink adds to their comfort during the night.

Horses which come in " off the job " very warm should have only a few swallows of water at a time and be kept walking until they have partially cooled off. It does not hurt a hot horse to drink provided he is kept moving afterward. Serious results, laminitis, etc., are likely to result from a large drink of cold water and a sudden cooling off in a breeze or cold barn. Water given to newly foaled mares should have the chill taken from it. Water tanks should be conveniently located, inspected often, and kept clean.

Salting.—Horses are probably best salted by having free access to block salt in their mangers and pastures. Some feeders prefer to add a tablespoonful of salt to one feed each day.

4. Feeding Farm Work Horses.—From 50 to 70 per cent of the cost of keeping a farm horse is represented by the cost of his feed. Fortunately this item, representing the largest single cost in farm horse keep, is one which can be greatly affected by good management. The other items of cost, including labor, interest on investment, depreciation, shelter, harness, and miscellaneous, are much smaller sums and much more fixed in character. In extreme cases, skillful and economical feeding of farm horses has resulted in a cutting of annual feed costs almost in two and at the same time the horses have been kept in a thriftier condition.

On certain farms in central Illinois where records were studied by the Department of Farm Management of the University of Illinois, the average yearly consumption of concentrate feeds per horse over a three-year period was approximately 1800 pounds of corn, 1400 pounds of oats, and 3 pounds of other concentrates—a total of 3200 pounds of grain. These same horses also consumed a yearly average of 1400 pounds of hay per head and 2150 pounds of other roughage, and were on pasture 167 days. During the year they worked an average of 788 hours per head. At the Illinois Station, 1500-pound farm work horses which averaged annually a total of 2500 hours of labor per head were fed an average of 1.21 pounds of grain and .96 pound of hay per hundredweight of horse per day. The grain in this instance was ear corn two-thirds and oats one-third by weight; clover was the hay fed. Another year horses performing approximately the same number of hours of labor in a year were fed an average of 1.10 pounds of grain and 1.03 pounds of hay per hundredweight of horse per day. The grain again was corn and oats in the above proportion and the hay was alfalfa or alfalfa one-half and timothy one-half.

Amounts of Feed for Horses at Work.—Stable-fed horses, at moderate work, require about 1 pound of grain per hundredweight of horse per day. One and one-fourth pounds is satisfactory for the hard-worked horse. The grain should be fed in equal amounts at the morning, noon, and evening feedings.

The hay fed to horses at moderate work should be about 1¼ pounds per hundredweight of horse per day. No more should be fed to the very hard-worked horse than to the one moderately worked. It is a good practice to give one-fourth of the day's hay ration at morning and at noon and the remainder at the evening feed, for no horse should be put to severe exertion when he is stuffed with hay. A further advantage of this plan is that there is more time available for eating the hay at night.

Painstaking regularity in feeding both hay and grain will not only save feed, but also promote better health. Exact amounts cannot be stated which will accurately suit all cases. The feeder must be skillful in both his observation and his judgment. He should notice carefully the appetite of the horse, the dung, condition of coat, weight, and spirit, and adjust the amounts of feed to bring the best results. The maintenance of a healthy condition of the bowels is important. During extremely hot weather horses which refuse their feed should not be worked; they may die suddenly in harness.

As previously mentioned, pasture should be used to cut down the costs of keeping farm horses. It will likewise add to their comfort and thrift. Ordinarily, horses should be turned out nights after the corn planting is over and this practice should be kept up throughout the season. Pasture, in the case of farm horses, will usually take the place of bran mashes and other regulators for the alimentary tract.

Amounts of Feed for Horses when Idle.—When feeding horses which have been at hard work and on a full feed of grain but which are idle for a day or two at a time, the grain should be reduced fully one-half. The farmer handles this situation correctly during the pasture season by turning out his idle work stock. Azoturia, a serious and sometimes fatal disease, is caused by heavy grain feeding to under-exercised horses. It is prevented by cutting down sharply on the amounts of grain fed during idle periods.

During the season when pasture is not available, mature

idle work horses will maintain their weight on good-quality roughage alone. Oat straw, corn stover, corn fodder, or cane hay may make up the bulk of the ration. One feed per day, in the evening, of legume hay will add to their thrift. If this is not available one small feed of grain per day may be given.

5. Fattening and Exercising Draft Horses for Market and Show.—Draft horses, sound and of good type and quality, which are to be sold on the market, usually pay well for being fattened. The increased weight adds to their size and smoothness of body and the higher condition puts additional oil in the hair and thus greatly improves the appearance of their coats.

Corn and oats, with small quantities of bran or linseed meal and mixed clover and timothy hay or timothy and a legume hay, one-half each, will produce good results. The use of ground grain mixed with cut hay and moistened with molasses water will " belly " them down a little more quickly than will the use of rations requiring less preparation. Grain is usually fed three times per day, sometimes four. Sudden changes in kinds, quality, or amounts of feed should be avoided. A few days before shipping, most of the grain ration should be discontinued. During transit the horses should be fed only lightly.

Breeding stock which is being fitted for show should be " rounded-to " very gradually by the use of safe, bulky feeds. Haste usually makes waste in the shape of unsound legs. The best feeds are crushed oats, bran, and choice mixed hay. In most instances corn should not be used. In the case of mares and youngsters of both sexes, it is a help to do the forepart of the fitting on good bluegrass pasture.

Exercise.—Stall-feeding of commercial draft horses, as it was done in former years by professional feeders, did the job quickly and with a minimum amount of feed for the gains made. However, this system requires much more skill and experience than is required to fatten a horse while it is being moderately worked or is running on pasture. Exercise during the fattening period makes a better horse for the man who buys him.

Show stock, after being shod all-around, are usually stabled and exercised by leading in hand.

6. Feeding and Exercising Pleasure Horses.—Oats, bran (one-fifth by weight), and bright timothy or very light mixed clover and timothy are the best feeds to use for pleasure horses. A pound of grain and a pound of hay to the hundredweight of horse per day should be adequate unless the work is excessive. Twice weekly bran mashes are in order. The quality of all feeds used should be choice. Expense is usually not so important an item as is doing the job well.

Exercise.—Pleasure horses should be ridden or driven at least five or six miles daily. In lieu of this they usually may be turned into a paddock for several hours daily. It takes both good feed and careful, regular exercise to insure the good spirits and muscular development which not only look good but will stand work at a rapid pace.

7. Feeding and Exercising the Breeding Stallion.—This is an important job which cannot be neglected without paying a penalty in the shape of shortened life and small foal crops. The sire will be a surer breeder and longer-lived if he is not permitted to get fat and soft but kept in a lean, thrifty condition. Two sound systems of management are described in the following paragraphs.

Box Stall and Paddock.—Under this system the stallion should be kept in a 16-foot square box stall which opens into a good bluegrass paddock of from one to two acres in extent. He should be kept on the grass as nearly as is possible the year around. The sun, air, and exercise are all in his favor. The amount of grain and hay to be fed should be determined by his condition. Feed enough oats, bran, and mixed hay to maintain a vigorous condition. No damage will be done if he loses some weight after the breeding season is over. He should be gaining a little in weight at the beginning and, if possible, during the season.

Exercise in Harness or under the Saddle.—A second system provides for plenty of exercise in capable hands and a good

work-horse ration as a means of insuring a potent sire. A mile or two per day of walking in hand is not enough. When a stallion is led on foot he usually fails to get enough exercise and the groom gets more than he needs. Furthermore, it is too expensive in most instances. "Traveling" the stallion to different farms for service gives him sufficient exercise.

8. Feeding and Exercising the Brood-mare and Foal.—This

Photo by R. J. Laible

FIG. 50.—DRAFT STALLIONS PLOWING

The two furrow horses and the center leader are stallions. Plenty of exercise in the collar and good feeding made these stallions sure breeders. They are profitable to both stallioner and mare owner. Stallions owned by Glenn Thomas.

is another particular job if success is to be had with horses. Most brood-mares have good appetites and will overeat and get too fat unless fed in somewhat limited amounts. Mares should be kept rather lean and in a thrifty, mellow condition and not be permitted to get either "as poor as poverty" or as fat as a highly-fitted show horse.

Feeding the Mare.—During the grazing season good pasture is sufficient for the mare unless she is being worked. If the

latter is the case she should have full rations in addition to a run to good grass at night. Oats and corn may be fed. When on dry feed, oats is the best single grain ration for the mare. Unless some legume hay is fed it will be advisable to give wheat bran in recommended amounts. Old, dry timothy, and straw are not suitable roughages for a brood-mare.

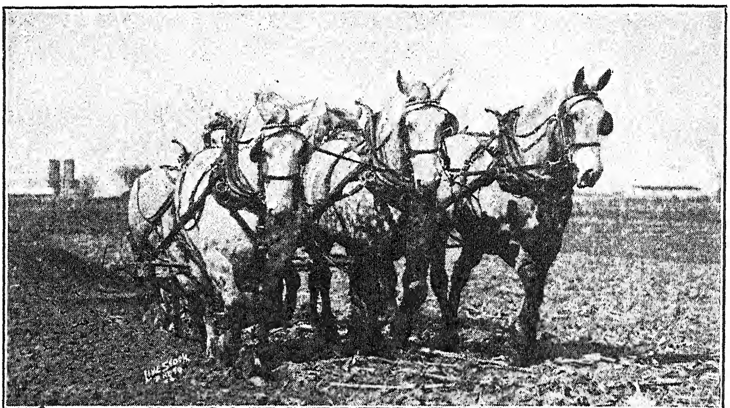
For a few days before foaling it is imperative to feed lightly on laxative feeds and to continue this kind of ration for a week or even more after foaling. Grass, provided the mare is already accustomed to it, is the ideal feed at this time. Some breeders prefer to feed a few ears of corn daily to the mare nursing a foal while on pasture.

At weaning time the mare should be put on scant rations of dry feed a few days before the foal is to be taken away. This light feeding should be continued until her milk dries up. Her udder should be watched and, if necessary, she should be hand-milked. Usually this will be necessary only a few times if her rations have been sufficiently cut. The best practice is to have the foal eating well before weaning and at weaning time remove the mare and the foal far enough apart so that they cannot see, smell, or hear one another. A roomy box stall with one or two companions is a safe place for the foal until it has forgotten its dam.

Feeding the Foal.—Keep the colt-fat on foals. This means to keep them in good growing condition. Good milking mares which are not worked will do this on good pasture alone. Whenever the dam starts to fail on the job then feeding the foal should be begun. Unless the pasture is very good the foals should be creep-fed. If the dam is worked, feed the foal in the box stall occupied by mare and foal. Foals quickly learn to eat out of their dam's feed box. A little later tie up the mare and feed the foal out of its own little feed box. Start with a few handfuls of crushed or whole oats and later increase the amount of grain to the amount that the foal will quickly clean up. Bran and oats are preferable to oats alone. Hay fed to foals should usually be choice legume hay. In any event,

foals should be eating grain readily when they are weaned at five or six months of age.

No attempt should be made to see how much a foal can be made to weigh. Well fed and bred draft colts will weigh 1000 to 1200 pounds at twelve months of age. The well-grown foal will make more than one-half his weight at maturity during the first year. Too much weight at an early age is likely to result in cock-ankles and puffy joints. A heavy foal with these



Courtesy of University of Illinois

Fig. 51.—Six-horse Hitch of Percheron Mares

With this hitch there is no side-draft, and 6 acres can be plowed easily and twice-harrowed per day. Idle draft mares are not profitable. The mares who earn their keep in the collar are usually the best breeders.

defects is not worth nearly so much as the sound lean foal. The idea to keep in mind is a good, sound, well-developed individual at maturity. Pasture is important; sound colts cannot be raised without it.

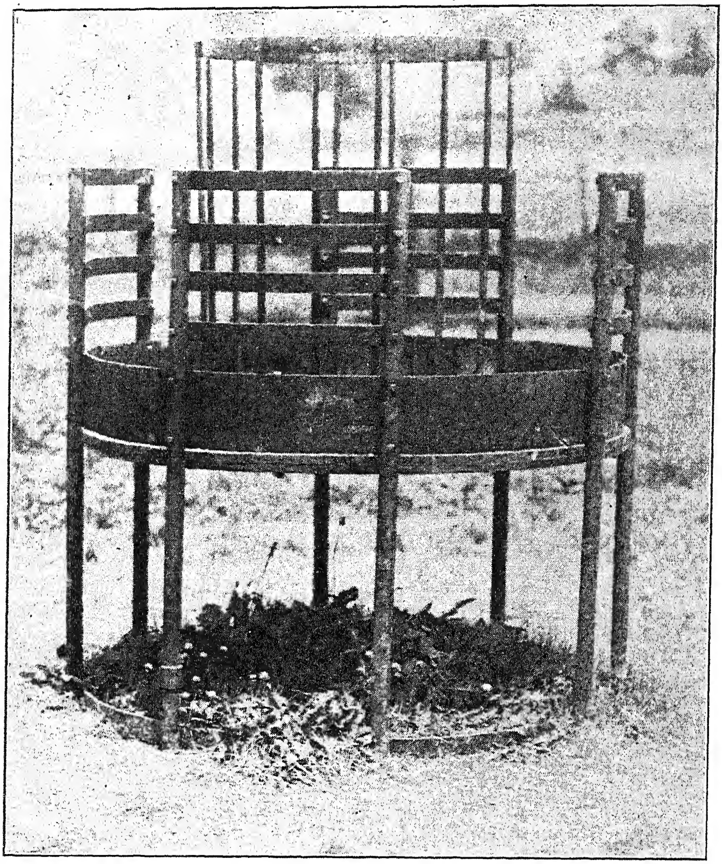
Exercise for the Mare.—Most draft mares should spend much time in harness. In but few instances can draft-bred foals be raised profitably from idle mares. Mares should not have the hardest, heaviest work on the farm nor be required to flounder around in deep mud or back heavy loads. Most

mares can be kept at reasonably heavy work right up until foaling time. After foaling they should have ten days, or preferably two weeks, of rest. For a few weeks, the foal should nurse the worked mare during the middle of the forenoon and afternoon. Do not let the foal nurse the mare while she is hot or follow her while she is in harness. This practice makes a nervous dam and the foal wearies itself trailing after its dam.

9. Feeding and Developing Yearlings, Twos, and Three-year-olds.—The amount and kinds of feed will vary with the colt and the purpose for which it is being grown. Purebreds which are to be disposed of should be well grown so that they may be sold at an early age. Grades may be carried along more slowly; however, they should be fed enough to make good growth of frame. Purebred fillies which are to be kept on the farm for breeding purposes should receive the same treatment as grades, as they will be better breeders if they are not kept in high condition. At the Illinois Experiment Station trials involving several lots of purebred Percheron fillies showed that they could be carried in good, strong condition from 7 months to 2 years of age on approximately 1500 pounds of grain, 4000 pounds of legume hay, and 3500 pounds of sheaf oats. These fillies were on pasture during the pasture season.

Pasture.—In raising colts it pays to use both rotated and permanent pasture, as discussed in Chapter XIII. Good pastures make a rugged frame and good-quality bone. In fact, they may be said to be the backbone of colt raising. No grain is ordinarily fed on good grass except to show colts. Show colts can be more safely brought to high condition if they are kept on grass while being fed grain than by any other method, as the grass provides the proper balance for the grain.

Roughage.—When colts are not on pasture, the use of some good legume hay, such as clover, alfalfa, or soybean, is advisable. In amounts, this kind of hay should make up about one-half of the total roughage fed. Mixed hay is very suitable. Sheaf oats and legume hay make colts grow and are an economical ration.



Courtesy of University of Illinois

FIG. 52.—"TUMBLER" FOR FEEDING HORSES ON PASTURE

This style of feeder is safer for horses than the rectangular troughs which are ordinarily used. This feeder was substantially made in the farm work-shop.

The legume hay should be limited to an amount which will insure the eating of the straw in the sheaf oats.

Bright corn stover, corn fodder, or cane makes good roughage to feed to colts on pasture during the winter. The feeding of different varieties of good-quality roughages to growing colts results in good growth at moderate costs. The importance of variation in roughages is not as generally recognized as it should be. It is one of the reasons for the success of certain breeders.

Grain.—From the standpoint of economy sufficient grain should be fed to colts to insure a good, even growth. It is a waste of feed and horse-flesh to permit colts to become "skin poor" at any stage of their development. Yearlings on pasture frequently benefit from moderate grain feeding. On the other hand, no more grain should be fed than is necessary to make good growth. Oats, half and half with ear corn, work well when a legume hay is also being fed. The use of a good legume roughage cuts down greatly on grain requirements.

Show colts should be given oats, preferably crushed, as the mainstay of their grain ration. As mentioned above, they can be more safely brought to high condition if kept on pasture while being grain fed than in any other way. A few ears of corn may then be safely added.

COMMUNITY STUDIES

Investigate the horse and mule feeding practices on different farms. Study large and small farms. Compare the practices on grain and livestock farms. Pay particular attention to the results in amount of work done and the appearance of the horses.

1. Does the system of farming being used produce suitable feeds:
   (*a*) Kinds, approximate amounts, and quality of the grain and roughage fed to the horses and mules?
   (*b*) Proportion of home-grown feeds being used?
   (*c*) Use of purchased mixed or by-product feeds?
2. Equipment for preparing feeds:
   (*a*) Necessity of preparing horse feeds?
   (*b*) Success in feeding without use of ground, crushed, or cut feeds?

3. Are the methods of feeding and exercising well adapted to the different classes of horses which are maintained:

(*a*) Feeding of work horses during the busy season?
(*b*) Feeding the work horses when idle?
(*c*) Use of pasture for idle work horses?
(*d*) Preparing surplus horses for selling?
(*e*) Feeding colts during the first year?
(*f*) Developing two- and three-year-olds?
(*g*) Keeping the breeding stallion in good health?
(*h*) Reasons for successes or failures with farm brood-mares?

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Note. See also the references in Chapter VII.

CHAPTER XI

FEEDING SHEEP

Proper feeding is an assurance that animals can produce to their full capacities. Good feeding cannot, of course, overcome inferior breeding, for no amount or kind of feed will cause a sheep to grow a 10-pound fleece each year if it is bred to produce only a 5-pound one. However, the feeding of animals is very important in relation to their growth, production, and health.

Management Problems:

1. Selecting the feeds.
2. Preparing special feeds.
3. Feeding the flock.

1. Selecting the Feeds.—In planning the feeding of the flock there are several points of importance.

Considerations:

(*a*) Feed preferences.
(*b*) Nutritional requirements.
(*c*) Use of farm-grown feeds.
(*d*) Water and salt.
(*e*) Cost.

(*a*) *Feed Preferences.*—If sheep are to make good growth and gains, they must consume fairly large amounts of feed, and for this reason it will be of decided advantage to select those feeds which are especially palatable to them. Sheep are ruminants, and because of this characteristic they consume relatively more bulky feeds than the non-ruminant animals. They are very fond of short grasses, preferring them to the

taller, more lush varieties, and because of their thin, mobile lips they can graze them very closely. Sheep are also fond of weeds and are said to eat most of the common varieties. Some weeds are poisonous to them and in various regions care must be used to avoid losses from this source. In addition to grasses and weeds, the leafy leguminous plants are well liked by sheep.

Sheep eat all the commonly grown farm grains, oats and corn being especially palatable. Their requirement for considerable bulk may be met by pasture or by various kinds of dry roughages. The legume roughages are particularly palatable. Many sheep raisers, especially those engaged in producing purebred stock, consider succulent feeds such as beets, rutabagas, turnips, and silage of importance in maintaining their flocks. All these are well liked by sheep. In lamb feeding silage and beet pulp are the succulent feeds most often used.

(*b*) *Nutritional Requirements.*—In general, the nutrients required by sheep are not different from those needed by other animals. The composition of the various parts of the sheep's body indicates the kind of nutrients which it requires in its feed. The feeds must contain these nutrients, for the animal itself cannot manufacture them. For instance, if the minerals the sheep needs are not in the things it eats it must get along without them as best it can. A sheep cannot change carbohydrates or fats into protein, even though it has a distinct need for protein because of its being an important part of both body and fleece. A ration which contains an adequate supply of proteins, carbohydrates, and fats, minerals and vitamins is the most certain means of enabling an animal to do well those things for which it is kept.

(*c*) *Use of Farm-grown Feeds.*—The form in which the various nutrients are found in farm-grown crops and pastures is undoubtedly the most suitable form in which to supply them to sheep. Under most conditions it is much more satisfactory, as well as better farm practice and better sheep husbandry,

to grow crops containing liberal quantities of minerals than it is to purchase various minerals for sheep. Various kinds of prepared feeds may be purchased for sheep, and some of these without question have good qualities, but the prices compared with the prices of farm-grown feeds usually make them uneconomical. If legume roughages, grown on fertile soils, are fed and these are supplemented when necessary with farm grains and perhaps on occasion with protein concentrates, there is no need for additional mineral feeds or condiments. However, it is true that in some areas feeds are deficient in iodine. This is usually manifested by the development of goiter. The deficiency, however, may be corrected by using iodized salt or by giving very small quantities of iodine mixed with the feed. Aside from this lack of iodine, sheep raised on fertile soils, apparently, are not apt to suffer because of mineral deficiencies.

(*d*) *Water and Salt.*—Sheep like fresh water and in spite of the many statements to the contrary it is essential to them. Even during cold weather they drink considerable amounts if it is fresh and of suitable temperature. Salt is also necessary in the ration. When the sheep are accustomed to it they may be given free access to it in either the loose or the block form.

(*e*) *Cost.*—Sheep are excellent grazers, and letting them make good use of pasture undoubtedly takes less outlay than any other way of feeding them. There are times on practically every farm, however, when exclusive pasture feeding may be very costly from the standpoint of results secured. No flock of sheep can grow and be productive to their full capacity if they are not given sufficient feed and if it is not of good quality. One should not be entirely guided, therefore, by first cost but rather should rely upon that ration which is most economical in terms of results obtained. Many sheep growers have managed to feed their ewes at very little expense, but the result has been a disastrous lambing season, when a little more costly ration might have increased the returns considerably. No rations which are inadequate and of poor quality can be considered an economy.

2. Preparing Special Feeds.—Special preparation of feeds for mature sheep is usually not necessary. Most grains are more palatable and valuable fed whole than ground. Cutting or grinding roughages sometimes increases the percentage consumed, thus avoiding waste, but it does not always save enough to cover the costs. Cut or ground hay is sometimes mixed with ground grains in the self-feeding of lambs. The hay makes the ration sufficiently bulky to prevent the lambs overeating. This is a relatively safe method of feeding and rapid gains may be obtained.

For young lambs and very old sheep, feeds are frequently ground or otherwise prepared. After lambs are a month or six weeks old, however, they show a decided preference for whole grains. Old sheep that have poor teeth need ground feed to do well. However, unless these sheep are very valuable it is often advisable to dispose of them rather than undertake to prepare feed for them.

3. Feeding the Flock.—

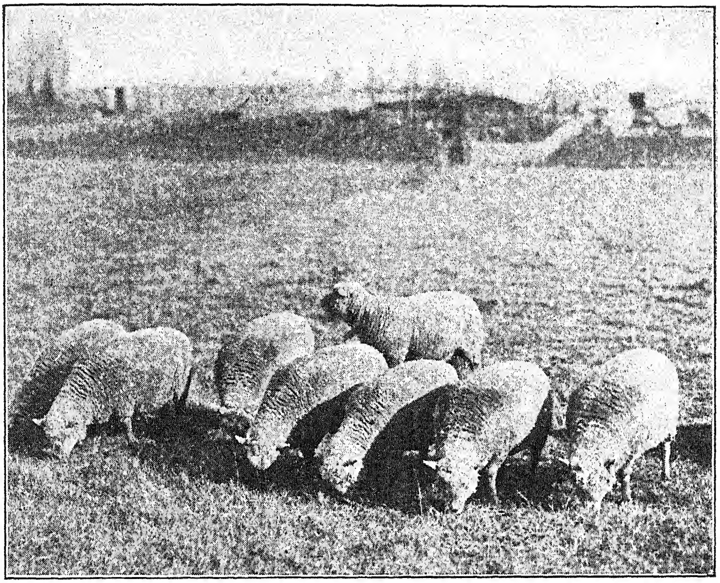
Considerations:

(*a*) Feeding ewes and rams at breeding time.
(*b*) Feeding ewes during pregnancy.
(*c*) Feeding suckling ewes.
(*d*) Feeding growing lambs.
(*e*) Feeding fattening lambs.

(*a*) *Feeding Ewes and Rams at Breeding Time.*—Ewes which are in good condition and gaining in weight at mating time are the most satisfactory breeders. The way in which ewes are fed shortly before and during the breeding season may have a direct effect on the number of lambs they produce. Special feeding at this time in order that the ewes may reproduce to the full extent of their inherited abilities is referred to as "flushing." It is usually begun about two weeks before the breeding season and continued during that time.

Flushing may be accomplished by the use of either pastures or grains. Ewes turned on more luxuriant and nutritious pas-

tures than those on which they have been grazing will likely gain in weight. The exclusive use of very succulent pastures, however, such as new clover, is not considered advisable. When suitable pasture is not available a small amount of grain may be fed in addition to the feed the ewes have been receiving.



Courtesy of University of Illinois

FIG. 53.—FLUSHING EWES

Ewes tend to produce more lambs if they are given very good pasture or a small amount of grain during the breeding season.

Many successful sheep raisers use whole oats for flushing. Approximately ½ pound of grain for each ewe daily is a suitable amount.

Although flushing is advisable, this does not mean that ewes should be allowed to become extremely thin during the summer with the idea that the flushing will be sufficient for getting them into satisfactory condition again. A moderate amount

of fat and a thrifty condition should be maintained at all times.

Vigor and health are especially needed in a ram during the breeding season, and for this reason a little extra grain should be given at this time. However, it must be remembered that feeding in itself cannot cause a naturally lazy or weak individual to become vigorous, for feeding cannot overcome heredity. With a ram that is being mated with at least 40 ewes, it is generally a good plan to give him extra feed apart from the flock. About 1 pound of grain, consisting chiefly of oats, will be ample. If good pasture is being used to flush the ewes the ram will usually do very well on this pasture and the grain. This is the only time of year, as a rule, when the feeding of the ram becomes a special problem, for at other times he will do well on good roughages or pastures.

(b) *Feeding Ewes during Pregnancy.*—The feeds for the ewes during pregnancy must be adequate not only for their body maintenance and growth of wool, but also for the growth of the fetus. During this important period and also while the ewes are suckling their lambs, they have a special need for protein in their ration. There is no better feed for supplying this need than legume roughages, such as alfalfa, clover, or soybean hay. These high-protein roughages not only supply sufficient protein for the ewes, but apparently they also have the necessary minerals and vitamins and provide the needed bulk in the ration. Experiments in which pregnant ewes have been fed with legume roughages alone seem to have demonstrated conclusively that these feeds provide all the necessary nutrients. Alfalfa, clover, or soybean hay, therefore, can be used with the assurance that all the nutrients are being supplied.

Since the cost of the ration must be considered, it is often advisable to use low-protein, non-legume roughages with the legumes. It is a good rule, however, when feeding pregnant ewes that at least half the total roughage should be the high-protein legumes. Less than this amount would not provide a

safe minimum of protein. A pregnant ewe weighing 125 to 150 pounds will require about 3 to 4 pounds of alfalfa or clover hay or 3½ to 4½ pounds of soybean hay daily. This would supply 13 to 15 per cent of total protein in the ration. If oat straw, for example, were substituted for half the legume hay, the percentage of protein in the ration would be reduced to 8.5

Courtesy of University of Illinois

FIG. 54.—USING FEEDS OF LOW VALUE

Some use may be made of such feeds for bred ewes but their nutrient requirements should be largely met by more nutritious roughages.

or 9.5, which would be the absolute minimum of safety. If the roughage ration is made up of more than half low-protein non-legumes or if it should be necessary to use them exclusively, enough protein supplement should be fed so that there will be at least 10 per cent total protein in the ration.

Although ewes should not require grain throughout pregnancy, it is many times advisable, especially with ewes which

lamb early before pastures are available, to feed a small amount of grain for four or five weeks before lambing. Approximately ½ to ¾ pound daily will be sufficient. For purebred flocks a mixture of 50 pounds whole oats, 50 pounds shelled corn, 10 pounds wheat bran, and 10 pounds linseed, cottonseed, or soybean meal is recommended. For commercial flocks a mixture of equal parts of whole oats and corn is satisfactory. Grain feeding during the period just before lambing helps the ewe nourish well the rapidly growing fetus and also assists in developing a good supply of milk for the suckling period. Ewes which lamb later generally produce large amounts of milk, if they are capable of doing so, on good green pastures alone.

Many sheep raisers consider roots, such as mangolds (mangels), turnips, and rutabagas, as being especially valuable for maintaining the health of the flock. In experimental comparisons silage generally excels roots in the amount of gain produced, but practical shepherds insist that the value of a feed does not lie wholly in the gain in weight secured and that the roots result in better general health.

Care in feeding ewes aids in avoiding loss of both ewes and lambs before and after lambing. Ewes which are fed properly seldom develop before-lambing paralysis (preparturient paralysis or acidosis) or fail to have an adequate supply of milk. Moreover, their lambs are generally strong and well grown at birth.

(*c*) *Feeding Suckling Ewes.*—If ewes lamb after pastures are available, no special provision need be made for feeding them. Succulent green pastures are nutritious and generally very palatable, and when growing on fertile soils they satisfy the appetites of ewes and stimulate milk production. It is of course important that the pastures be kept in a sanitary condition.

For ewes which lamb before pastures are ready it is a good plan to use the same feeds as before lambing but to provide them in greater amounts. Thus, if one had been feeding a

daily ration of ¼ pound whole oats, ¼ pound shelled corn, 2½ pounds clover hay, and 2½ pounds corn silage, these same feeds would provide a good ration after lambing if the oats and corn were increased to ½ pound each and the hay and silage, especially the silage, were fed to the limit of the appetites of the ewes.

If grain has not been fed during late pregnancy it is always advisable, in the case of ewes lambing early, to provide some during the suckling period, for this assists in milk production. Milk is the most important feed of young lambs and if rapid growth is desired their dams must be well fed.

After the lambs are weaned the ewes should need only pasture until the next breeding season.

(*d*) *Feeding Growing Lambs.*—The way in which young lambs are fed will depend on whether they are early- or late-born and also on whether they are to be sold on the market as lambs or kept and added to the breeding flock.

As a rule the market prices for lambs are higher during the first six months of the year than during the last six months, and for this reason many growers usually find it profitable to have their lambs ready for market before summer. To bring the highest prices the lambs must be well grown and well finished. As an aid to getting them into this condition many growers practice creep-feeding, building special pens, known as creeps, in which the lambs can be given suitable feeds apart from the ewes.

The creeps must be constructed so that the lambs can enter them easily, and the feeds offered must be tempting and nutritious. It will usually be necessary to teach the lambs to enter the creep and see that they eat fairly large amounts of the feeds. One of the best ways to do this is to drive them into the creep and keep them there for 20 or 30 minutes morning and evening. The troughs and racks must be kept clean at all times, as young lambs are very fastidious and will not eat soiled or damaged feeds readily.

To get best results from creep-feeding the lambs must first

of all have a good supply of milk from their dams. They should be fed both roughage and grains. These should always be of the best quality obtainable. The roughage preferably should be choice legume hay. The grains should be a mixture

Courtesy of University of Illinois

FIG. 55.—GROWING LAMBS

These twin lambs have not lacked feed. Their mother produced a large amount of milk and they received grain and pasture in addition.

of two or more kinds. For very little lambs, ground, rolled, or cracked grains are best. After the lambs are two months of age, whole grains are preferable.

The grain ration fed with a legume roughage should contain a minimum of from 12 to 14 per cent of protein. As the lambs

approach market weight, it need not contain more than approximately 10 per cent of protein.

During the first month or two a mixture such as 100 pounds ground corn, 100 pounds ground or whole oats, 50 pounds wheat bran, and 50 pounds linseed meal, fed with choice legume hay, is a very satisfactory ration. After the lambs are six weeks or two months old the grains in the ration may be fed whole and the proportion of protein gradually lowered by decreasing the amount of linseed meal. Rapid gains may be secured if the legume hay is cut or ground and mixed with the ground grains. This may safely be fed in a self-feeder, as the hay makes the ration sufficiently bulky to prevent the lambs overeating.

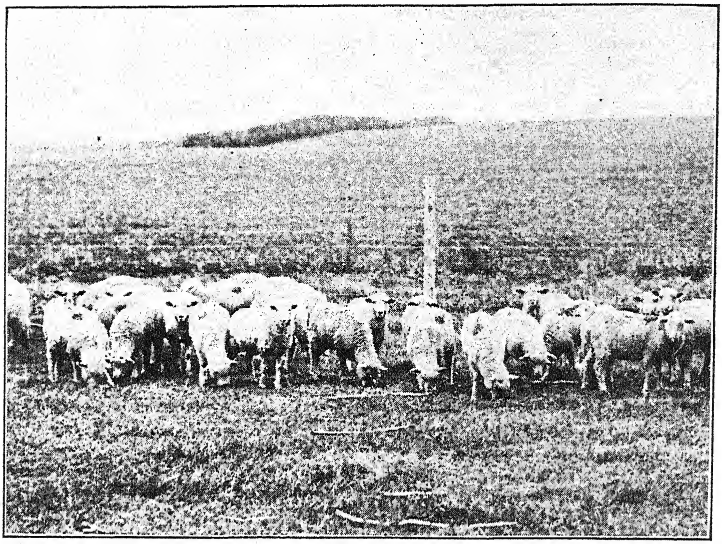
Lambs fed in creeps if kept healthy should be ready for market at weaning time. Young lambs that are on good palatable pasture and whose dams nurse them well, often will not eat much grain in the creep, but if care is taken, as described above, to induce them to eat, many sheep growers are convinced that creep-feeding is the best method of feeding to insure having the lambs well finished for an early market.

Those ewe lambs which are to be kept and added to the breeding flock should be provided with good clean pastures so long as available. During the winter these young ewes should be kept growing by means of a ration consisting chiefly of legume roughages, perhaps silage, and a small amount of oats. It is important that those lambs which are intended for breeding should attain good size.

(*e*) *Feeding Fattening Lambs.*—Lambs purchased for fattening are generally those which have been shipped in from the western ranges where they are produced. Such lambs, known as feeder lambs, are available on the markets in large numbers during the late summer and fall months. They are generally 4 to 6 months of age but lack the fat which would make them suitable for slaughter. Hence, the problem in feeding them is mainly to improve their condition.

Lambs which have not been fed grain must be given only

small amounts during the first part of the feeding period. At this time they may be given good roughages in such quantities as they will consume. Because of the danger of losses from digestive disturbances it is advisable to increase the amount of grain slowly. A 60-pound feeder lamb may be given about $\frac{1}{4}$ pound of grain daily for the first week. This may be in-



Courtesy of University of Illinois

FIG. 56.—FEEDING WESTERN LAMBS

Pasture feeding very often precedes a finishing period in dry lot.

creased about $\frac{1}{4}$ pound each week until a maximum of $1\frac{1}{2}$ to $1\frac{3}{4}$ pounds daily is being fed. It is better to feed a few days longer than to strive for maximum gains by extremely heavy feeding. Overfeeding or overeating of concentrates is very often a definite source of loss. As the quantity of grain is increased the roughage allowance may be decreased. Fattening lambs, however, should be fed all the roughage they will eat. Some feeders use oats to start lambs on feed. Other

feeders with equal success use corn or barley without oats throughout the feeding period.

If western lambs are to be turned on fresh green pastures or into cornfields they should be allowed to rest in a lot for the first few days after they are received and be fed dry roughage. When they are turned on pasture some roughage should be fed each day till they are fully accustomed to the green feeds.

A ration of shelled corn and legume hay generally gives good results in fattening lambs. As an average for a 90- or 100-day feeding period lambs eat approximately 1¼ to 1½ pounds of corn and 1½ to 1¾ pounds of hay per head daily. Shelled corn is preferable, but either ear corn or ground corn is often used. Alfalfa, clover, or soybean hay may be used. Good lambs fed in this way should gain approximately ⅓ pound per head daily. Hence, a 60-pound lamb may be expected to weigh 90 pounds at the end of a 3-months' feeding period. These figures are based on feed-lot weights.

Soybean oil meal, linseed meal, cottonseed meal, or similar feeds of high-protein content added to the ration of corn and legume hay will generally increase the rate of gain a small amount. To be profitably fed such feeds usually must be available at a price per ton that does not exceed the value of 40 bushels of corn and 1 ton of legume hay. These feeds are often fed at the rate of 1 pound to 7 pounds of corn or other grain.

Wheat is about as valuable per pound as corn. Whole wheat is more palatable than ground wheat, but it is usually advisable to grind it coarsely to prevent the loss from whole grains being excreted undigested.

One hundred pounds of barley has a value for fattening lambs equal to about 85 pounds of corn. Whole barley, except in the case of very hard varieties, is superior to ground barley.

Oats is often used in the early part of the fattening period. As a sole grain it has a value per hundredweight of approximately 70 pounds of corn. Because of its bulk it reduces the roughage required.

Other grains have values that correspond more or less closely to their chemical composition compared with that of corn.

Legume roughages are most suitable for fattening lambs. Alfalfa and clover of comparable qualities are similar in value. Soybean hay is about one-fifth to one-fourth less valuable per ton than alfalfa.

Mixed clover and timothy hay is superior to timothy for fattening lambs. Timothy is similar in value to oat straw.

Corn silage is very suitable and may reduce the cost of gains in weight. When used with corn and legume hay it is advisable to use a protein concentrate also. Two pounds of good corn silage generally replace 1 pound of dry roughage. Fattening lambs will usually eat about 1½ to 2 pounds of silage per head daily.

FARM STUDIES

1. Keep a record of the pasture area required and the feed consumed by the sheep on your farm. What percentages do feed and pasture costs represent of the total cost of keeping the flock?

2. What percentage of the pasture on the farm is utilized by sheep? Do you think the return received per acre for the pasture so used compares favorably with the return from other crops?

3. Using the data in the table in Chapter VII showing nutrients in feeds, determine the percentage of protein of the rations given the flock at various periods.

4. If records are available, calculate the return received for each dollar's worth of feed fed to the flock.

5. Keep a record of the feeds given to lambs in the creep. Calculate the cost. How much does this add to the cost of keeping the flock?

6. Visit a lamb feeder and learn the kinds and amounts of feed used by him for a given number of lambs. Find out the gain in weight secured. Calculate the feed cost per 100 pounds gain.

7. Make a list of several rations for pregnant ewes, growing lambs, and fattening lambs. Calculate the cost of each, using prices prevailing in your community.

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NOTE. See also the references in Chapter VII.

CHAPTER XII

FEEDING SWINE

THE importance of feed in swine production is indicated by the fact that feed represents approximately 85 per cent of the total cost of producing pork. The swine grower who expects to make maximum profits from his enterprise, therefore, must realize the importance of suitable rations and proper methods of feeding.

Management Problems:

1. Adapting the ration to the needs of the animal.
2. Selecting the feeds.
3. Preparing the feeds.
4. Feeding the breeding herd.
5. Feeding growing, fattening pigs.
6. Considering miscellaneous problems.

1. Adapting the Ration to the Needs of the Animal.—The relatively small capacity of the digestive tract of swine and their ability to gain so rapidly in proportion to size, place a limit upon the amount of roughage and other feeds of high fiber content that they can utilize. This is especially true of animals that are being fed for high production, such as fattening pigs and sows that are suckling litters.

The feed requirements of swine vary with the purpose for which they are being fed. Fattening hogs use nutrients in very different proportion from that best adapted to growing animals, while the requirements of brood sows differ from both of these. One of the primary considerations that should determine

what ration to feed under given conditions, therefore, is the object for which the pigs are being fed. (See pages 233, 237.) Of equal importance to successful swine feeding is an understanding of the composition and characteristics of the available feeds and some experience with the manner in which swine react to them.

2. Selecting the Feeds.—Swine will eat a large number of different feeds. This wide appetite gives the feeder who understands the requirements of the animals and the characteristics of the available feeds an opportunity to utilize those feeds that will supply the necessary nutrients at the cheapest cost. Such a feeder is not the slave of habit and tradition, but can adjust his operations to meet changing conditions.

Considerations:

(*a*) Factors that affect the value of feeds for swine.
(*b*) The feeding value of grains.
(*c*) The feeding value of protein supplements.
(*d*) The value of forage crops for swine.
(*e*) The value of mineral supplements.
(*f*) Feeds as sources of needed vitamins.

(*a*) *Factors that Affect the Value of Feeds for Swine.*—Swine feeds are primarily of two classes: (1) the farm grains and feeds of similar composition, which constitute by far the larger part of the ration; and (2) the supplemental feeds that contribute protein, mineral matter, and at times vitamins, that may be lacking or present in inadequate amounts in the basal ration. Forage crops, particularly if they are leguminous, are also of great value in the rations of swine because of the nature of the protein and the minerals and vitamins they contain.

In applying the knowledge of feeds acquired in the study of Chapter VII to the feeding of swine, it is desirable to keep in mind the importance of protein and the inability of swine to handle feeds that are high in fiber.

The value of a feed may be affected by the proportion of the ration it forms, as is illustrated by the decreasing value of oats

as their proportion in the ration increases beyond a certain point. The other components of the ration also influence the value of a given feed. For example, protein supplements are found to be less valuable when fed on pasture than when fed in dry lot. Other illustrations of these two points will doubtless suggest themselves to the reader.

Another important factor that affects the value of a feed is the class of swine to which it is being fed. Protein supplements added to a ration of farm grains save much more grain in the ration of full-fed pigs than they do if fed to pigs that are gaining at a slower rate. Protein supplements are also more important for young pigs and lactating sows. Feeds of high fiber content are less of a handicap in the ration of mature dry sows and shotes on light feed than they are in the ration of milking sows and fattening pigs on full feed.

(*b*) *The Feeding Value of Grains.*—The common farm grains are very similar in composition except for the high fiber content of oats. They contain too little protein, calcium, and common salt for most classes of swine. Yellow corn contains enough vitamin A to meet the needs of swine, but no vitamin D, while the other grains lack both A and D. When fed in connection with pasture or well-cured, leafy legume hay the absence of these vitamins is not a handicap to the grains.

Corn and wheat are usually more palatable to pigs than the other grains and apparently vary less in composition and feeding value from place to place. Corn is the easiest grain to feed. Because of its large, relatively soft kernels it can be fed in the ear or shelled according to convenience, while the smaller grains should be coarsely ground for best results. Even the cost of harvesting corn can be saved by "hogging down" the crop where fall rains are not too heavy.

The common grains, except oats, may be fed as any part or all of the grain portion of the ration of hogs of all classes. The relative values of the grains are approximately as follows: Corn, 100; cracked wheat, 105–108; cracked barley, 65–95, depending upon quality and plumpness; ground rye, 75–95,

depending upon quality; and ground kafirs and grain sorghums, 85–95.

Oats, because of their fibrous, indigestible hull cannot be fed to greater extent than about one-third of the ration of fattening pigs without reducing the rate of gain. Fed to this extent, whole oats are worth about two-thirds to three-fourths as much as an equal weight of corn, while ground oats may be worth almost as much as corn. Grinding oats increases their palatability to pigs and results in a saving of about 28 pounds of feed for each 100 pounds of oats ground and fed to fattening pigs. Oats make an excellent addition to the ration of the breeding herd.

(*c*) *The Feeding Value of Protein Supplements.*—Protein is most frequently the limiting factor in the ration of swine. This is due to the fact that the farm grains and many of the by-products commonly used for swine feeding carry less protein than the animals require. Not only is the protein of the grains inadequate in amount, but its quality is not well suited to the needs of swine. While seeds, such as beans, peas, soybeans, and cowpeas, contain a liberal percentage of protein, its quality is not satisfactory.

The protein supplements used with swine rations are of two sorts: (1) those of plant origin, such as soybeans, soybean oil meal, linseed meal, cottonseed meal, corn germ oil meal, gluten meal, and the by-products of the milling and starch industries; and (2) those of animal origin such as skim milk, buttermilk, tankage, and fish meal. Supplements of plant origin may supply an abundance of protein though its quality for the most part is not satisfactory. If used as the only supplement to grains they leave the ration still deficient in certain mineral elements, principally calcium and the elements of common salt. The supplements of animal origin as a general rule have a much higher supplementary value than those of plant origin as they are rich not only in protein well suited to swine, but also in the needed mineral elements.

Experiments have shown that a ration of farm grains can always

be improved by the addition of a suitable protein supplement. The extent of the improvement depends upon the age of the pigs and the other feeds being given. Young pigs suffer more than older ones from insufficient or unsuitable protein in the ration and hence respond more to the addition of a supplement. A protein supplement fed in dry lot returns much more in added gains and feed saved than when fed to similar pigs on pasture.

Skim milk and *buttermilk* excel any other single feed in supplementary value. Especially are they recommended for pigs just after weaning. Roughly, 100 pounds of either of these dairy by-products can be considered worth the price of a half bushel of corn.

The amount of milk to feed for greatest returns will depend, of course, upon the relative prices of feeds. When skim milk is fed in small amounts it has a higher value per pound than when it makes up a large proportion of the ration. It usually pays to feed enough skim milk or buttermilk to balance the ration. Young animals require a larger proportion of milk to grain than older animals do. However, they eat less total feed in a day. When allowance is made for both of these factors it is found that about one gallon of skim milk or buttermilk per head daily will balance the corn ration of full-fed pigs from weaning to market weight. During the period of rapid growth between weights of 90 and 130 pounds, it may need 1½ gallons of milk to balance the ration, while after the pigs weigh 175 pounds less than a gallon may suffice.

Both skim milk and buttermilk should be pasteurized in order to prevent the spread of tuberculosis and possibly contagious abortion in the swine. The principal handicap to the wider use of these feeds in swine feeding is the insufficient supply available and their bulk, which practically prohibits moving them from areas of surplus production.

Other milk products that are used more or less extensively in swine feeding are whey, semi-solid buttermilk, and milk powder.

Whey is not rich in protein, this nutrient having been

largely removed in the cheese-making process. The average results of a number of feeding trials gives whey a value equal to about half that of skim milk. For light pigs whey is considerably less valuable than this.

Semi-solid buttermilk is the regular creamery buttermilk condensed by evaporation to about one-third its volume. Feeding trials in which it has been compared with tankage as a supplement to corn indicate that on the average it is worth only about one-third as much as an equal weight of tankage.

Milk powder, made either from skin milk or buttermilk, is an excellent feed, but its price is usually much too high to make its use in swine rations profitable. The rather limited study that has been given this feed suggests that its value in a ration is about three-fourths that of an equal weight of tankage.

Tankage, a by-product of the packing industry, is the most widely used high-protein supplement that is now fed to hogs. High-grade tankage contains 60 per cent of protein and 15 per cent of mineral matter, both of which are utilized well by hogs. Results of well-controlled experiments indicate that fully 76 per cent of the protein of tankage is digested.

The amount of tankage to feed under given conditions will have to be computed from feed compositions and the requirements of the animals being studied. Full-corn-fed fattening pigs in dry lot will require from .4 pound per head daily, when they weigh 30 to 50 pounds, to .75 pound during their rapid growth at a weight of 90 to 130 pounds. Their requirements decrease to .3 to .4 pound as they approach a weight of 200 pounds. Approximately half these amounts will be sufficient on good pasture.

Probably the most important deficiency of tankage as a swine feed is its lack of vitamins A and D. Farm grains have similar deficiencies, except yellow corn, which contains the A factor. Pigs fed a ration of grain and tankage in dry lot, without access to sunlight, as might occur in winter or if housed continuously, develop typical symptoms of vitamin deficiencies, which, if allowed to become severe, materially

retard growth and may even result in death. Young pigs react to these deficiencies more quickly than older animals.

A *mixed supplement* developed at the Wisconsin Station corrects some, at least, of the deficiencies of tankage. It is composed of two parts by weight of tankage and one part each of linseed meal and alfalfa meal or chopped alfalfa hay. The mixture contains approximately 42 per cent of protein of good quality and is rich in minerals and vitamins. The Wisconsin Station reports comparisons of this supplement "not alone with the standard ration of corn and tankage, but also with the ideal combination of yellow corn and skim milk. Young pigs have been taken right from their mothers in the fall and put on these various rations at 8 to 9 weeks of age. To our amazement the pigs given the combination of corn, tankage, alfalfa and linseed meal, without pasture and with no dairy by-products whatsoever after weaning time, have excelled in gains the pigs fed yellow corn and skim milk. The same results have been secured in repeated trials."

When prices of feeds or their availability make it desirable, there are certain substitutions that can be made in the mixture that do not materially affect its feeding value. For example, soybean oil meal or cottonseed meal has been substituted for the linseed meal, and clover or soybean hay if of good quality can apparently replace the alfalfa hay, and fish meal may be substituted for the tankage.

Fish meal of good quality has in feeding tests proved somewhat superior to tankage as a supplement to corn in spite of its somewhat lower protein content.

Soybeans provide a source of home-grown protein that can be used in a limited way in swine feeding. They are not palatable to pigs and if fed to any great extent to fattening pigs cause soft pork. Fortunately they can be fed satisfactorily to brood sows as a protein supplement to farm grains (see page 234). Because of the mineral deficiencies of soybeans, animals whose rations are supplemented with them should be allowed access to a suitable mineral mixture (see page 230).

Grinding the beans is unnecessary. In warm weather it is even detrimental because the oil thus exposed to the air and bacterial action becomes rancid, making the beans unpalatable.

Soybean oil meal is a much better hog feed than are the original beans. It is more palatable than the beans and is not detrimental to the quality of pork and lard produced. As a supplement to corn it has about two-thirds the value of tankage per pound. As with the beans, it should be fed with a suitable mineral mixture. Its use in a mixed protein supplement has already been mentioned.

Linseed meal and *cottonseed meal* are not satisfactory supplements by themselves, though they may be used in mixed supplements. Linseed meal is frequently used in brood-sow rations for its laxative effect. Cottonseed meal is poisonous to pigs if fed in large amounts.

Wheat middlings or shorts are fed extensively to swine. Their value as a supplement in the ration, however, is frequently overrated. Experimental tests show them to be less of a protein supplement than a substitute for corn. In these tests middlings proved to be less valuable for light pigs than they were for those of heavier weights.

Choice of a Protein Supplement.—There is no simple method of determining without trial which of two supplements will give better results under given conditions. The general superiority of supplements of animal origin over those from plant sources should be kept in mind. Further than that the problem resolves itself into buying protein of satisfactory quality where it can be purchased most cheaply, since farm-grown feeds supply an abundance of the other necessary nutrients.

Buying protein supplements on a basis of the cost per pound of protein they contain (see page 137) purposely disregards the carbohydrates of the supplements, not because they have no feeding value, but because they are no more valuable than the carbohydrate material which is so abundant in all farm grains at a much lower cost. While an exact

solution of the problem is not just as simple as this method suggests, still to select supplements on a basis of the cost of a pound of protein they carry has much to recommend it in practice, since it is protein that most swine growers must buy. Comparison of new supplements should, of course, be made with standard supplements of known high value.

(*d*) *The Value of Forage Crops for Swine.*—Nothing will solve

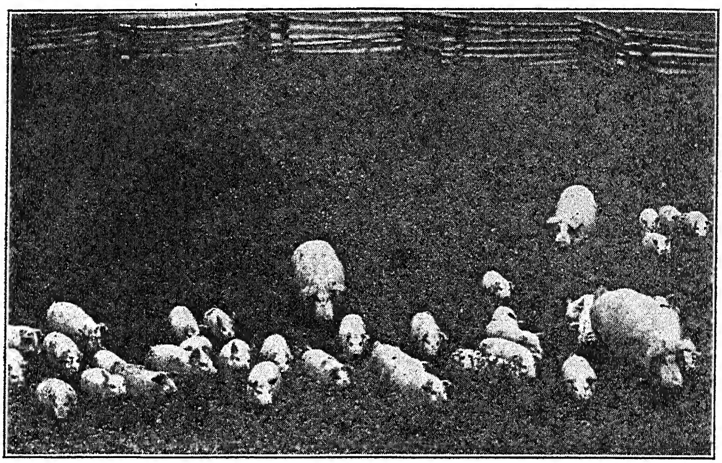


Photo by Allen

FIG. 57.—"PIGS IN CLOVER"

Success in feeding swine is much more easily attained if good forage is a part of the ration. All classes of hogs respond to good pasture.

more problems of the pork producer than an abundance of good forage. Not only does it supply valuable nutrient material that can be obtained from no other source, but it is of inestimable value in carrying out any careful program of swine sanitation.

Swine of all classes respond to good forage. Especially is it valuable in the ration of young pigs. Mature sows may need little else than good forage during most of the gestation period. Full-fed fattening pigs utilize pastures less extensively than

other classes of swine, but its value for them is shown by increased gains and a saving of feed.

The amount of feed saved by pasture depends upon the quality of the forage and the character and amount of the rations fed. Good pasture will save from half to all of the protein supplement—all of it in feeding mature, dry sows and even growing pigs on a light grain ration, and as much as half of it in the case of young pigs and fattening shotes on full feed. Experiments have shown that an acre of good forage will save from 900 to 1200 pounds of feed in making gain on fattening hogs, a large part of the feed saved being protein supplement. Stated in another way, it has been estimated from experimental studies that an acre of good forage may be credited with producing 200 to 600 pounds of pork.

The carrying capacity of pastures will vary, of course, with the factors that influence the yield and palatability of such crops and the care given the pasture, as well as with the method of feeding the pigs. An acre of good forage properly handled to keep it productive can usually be depended upon to carry from 10 to 20 hundredweight of pigs for 120 to 180 days.

In general, alfalfa and the clovers are the most satisfactory forage crops for hogs because of their composition, palatability, length of grazing season, and total forage produced. Most annual legumes, such as soybeans and cowpeas, are not well adapted to grazing. The grasses and cereals are usually less palatable, provide a shorter grazing season and less total forage, and save less grain than the clovers and alfalfa. Rape and sudan grass, where they grow well, are both excellent forage crops for hogs.

(e) *The Value of Mineral Supplements.*—The dozen or so mineral elements that are essential to life are present in varying amounts in all common feeds. With most rations common salt is the only additional mineral that hogs need regularly. After a pig's hunger for salt has been gradually satisfied, he can eat it without danger and should be given free access to it. With certain rations it is advisable also to provide additional

calcium, which is used so extensively in bone growth and milk production. This is because the grains, which constitute so large a part of swine rations, are relatively poor in this element. On the other hand, many of the protein supplements in most common use are rich in calcium. This is especially true of the animal proteins—skim milk, buttermilk, tankage, and fish meal. Enough of any of these to balance the ration from the standpoint of protein will at the same time correct the mineral deficiencies of farm grains except for common salt. Good pasture also makes the feeding of supplemental minerals unnecessary.

Protein supplements from plant sources, however, such as soybean oil meal, linseed meal, and cottonseed meal, do not contain enough calcium to correct this deficiency of farm grains. As a result mineral supplements have some value with rations made up entirely of concentrates from plant sources. Even under such conditions the improvement in the ration is relatively small. Studies have shown that the mineral deficiencies of such rations can be corrected rather simply by making available to the pigs a mixture of salt and bone meal, salt and ground limestone, or salt and wood ashes in the proportion of one to two or even equal parts. A mineral mixture that has given excellent results contains ground limestone, bone meal, and salt in the proportion of 2 : 2 : 1. This simple and cheap mineral will accomplish in practical swine rations all that any mineral can be expected to accomplish.

As a prevention of the hairless pig malady in goiterous areas one ounce of potassium or sodium iodide should be added to each 100 pounds of this mixture for pregnant sows. Better still would be the use of an iodized salt.

The appetite of the pig is apparently a reasonably safe guide to the amount of minerals needed. It is therefore unwise to mix the mineral with any part of the ration, for to do so usually results in the consumption of much more mineral than is necessary at the expense of feed that would produce gain.

(*f*) *Feeds as Sources of Needed Vitamins.*—Pigs fed in dry

lot, especially in winter, may suffer from lack of vitamins in their ration. Under such conditions it is advisable, of course, to include certain feeds in the ration because of their vitamin content. Vitamins A and D are those most likely to be lacking. Yellow corn is rich in vitamin A but does not carry vitamin D. The other common farm grains and seeds carry neither A nor D in appreciable amounts. The lack of vitamin D may be met reasonably well by adding from 2 to 5 per cent of leguminous hay of good quality to the ration. Fish meal is the only other common swine feed that carries this vitamin to any extent. Exposure to bright sunlight is a good substitute for vitamin D in the ration. Pigs which are on leguminous pasture seldom suffer for lack of vitamins.

3. Preparing the Feeds.—Most feeds require no preparation before being fed to hogs. In some instances, however, preparation results in a saving of feed.

Methods:

(*a*) Grinding or rolling.
(*b*) Soaking.
(*c*) Cooking.
(*d*) Slopping.

(*a*) *Grinding or Rolling.*—Small, hard grains, such as barley, wheat, and rye are frequently ground coarsely or rolled as a means of saving feed. The extent of the saving to be expected from this preparation depends somewhat upon the hardness of the kernel, but primarily, in all probability, upon the method of feeding. Pigs that are hand-fed in groups eat so hurriedly that a large number of the small, flinty kernels, if fed whole, escape being broken by the teeth and pass through the body unutilized. Pigs that are accustomed to eating from a self-feeder eat more slowly and masticate their feed more completely. Early tests in which the pigs were hand-fed showed a saving of 15 to 22 per cent by grinding small grains. The results of recent tests point to the possibility that with self-fed pigs grinding may save little if any feed.

If grains are ground, they should be ground coarsely—barely cracked—since, except in the case of oats, they are more palatable in this form than if ground fine. This is fortunate since coarse grinding requires only about half the power and time needed to grind the same grain to a fine state.

(b) *Soaking.*—Soaking is a poor substitute for grinding small grains and it does not improve the value of corn or the cracked small grains.

(c) *Cooking.*—Cooking reduces rather than increases the

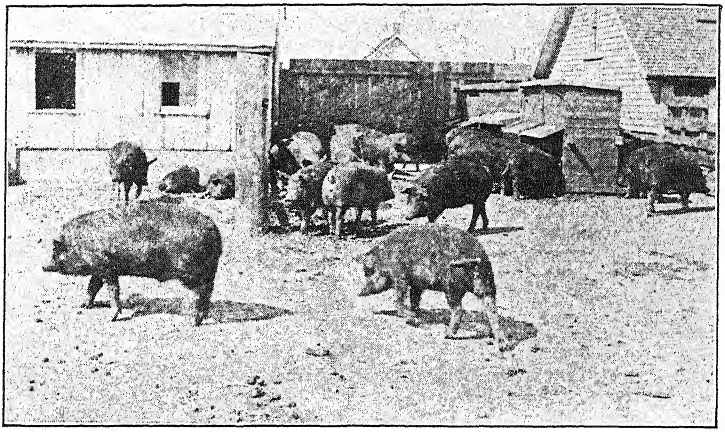


Photo by R. J. Laible

FIG. 58.—A GOOD FEEDING-FLOOR

Ear or shelled corn or even whole oats may be fed directly on such a floor if it is kept clean. A floor built with a slope of about 1 inch in 14 inches makes it practically self-cleaning so far as cobs are concerned.

value of most feeds for swine. Potatoes are an exception to this rule as tests have shown that raw potatoes are worth only about two-thirds as much as cooked potatoes for fattening hogs.

Recently the Ohio Experiment Station has reported excellent results from cooking soybeans. Cooking made them much more palatable and increased their value per pound in the ration of fattening pigs. Whether cooking either of these

feeds will actually pay will depend, of course, upon the cost of the operation.

(*d*) *Slopping.*—Slopping pigs is an old practice. Recent tests, however, have failed to justify the practice with fattening pigs and there is little evidence to indicate that it is a necessary procedure even with brood sows.

4. Feeding the Breeding Herd.—The problems arising from feeding the breeding herd differ materially from those associated with feeding fattening pigs. Feed makes up somewhat less of the total cost of carrying breeding animals than of fattening pigs and the idea of transforming feed into pork is also less prominent.

The exact requirements of breeding animals have not been determined. It is evident, however, that both the character and the amount of feed should vary with their age and condition and the object for which they are being fed. In absence of exact information on this important question Table 10 represents an attempt to summarize certain characteristics of rations that have proved satisfactory. Some variation from these suggested averages should be entirely consistent with good results. The availability of pasture will permit a reduction in both the protein content of the ration and the total amount of feed fed.

TABLE 10

COMPOSITION OF A SUITABLE RATION FOR BREEDING ANIMALS

	Minimum Percentage of Protein	Maximum Percentage of Fiber	Total Feed per Day per Cwt.
			Pounds
Pregnant sows	10–12	11	1.0–1.4
Pregnant gilts	12–14	10	1.2–1.5
Sows and gilts with litters	15–16	5	3.0–5.0
Young gilts and boars	12–14	7	3.0–4.0
Boars during breeding season	12–14	5	2.0–4.0
Idle boars	10–11	10	1.0–1.3

The feeder's job is to feed the animal as economically as possible without imparing its usefulness for the purpose it is being kept.

Procedure:

(*a*) Feeding pregnant sows.
(*b*) Feeding sows at farrowing time.
(*c*) Feeding sows with litters.
(*d*) Feeding boars.
(*e*) Developing pigs for the breeding herd.

(*a*) *Feeding Pregnant Sows.*—During the 114 days of gestation the sow should be fed to gain from 80 to 125 pounds, depending upon her age and condition when bred.

Any of the farm grains can be used as the main part of the ration of pregnant sows. Sufficient protein supplement should be fed in addition to bring the percentage of protein in the ration to that suggested in the table. Roughly this will require ½ gallon of skim milk, ½ pound of soybeans, or ⅓ pound of tankage, or an equivalent amount of protein from other suitable feeds, per sow daily. If good pasture is available mature sows may need no supplement with farm grains during the first half of gestation. Protein supplement fed during the last month or six weeks is usually well paid for in increased milk flow and decreased likelihood of the sows eating their pigs. Gilts should be allowed a supplement all through gestation whether in dry lot or on pasture. Water and salt are, of course, necessary.

(*b*) *Feeding Sows at Farrowing Time.*—If the sows are put in farrowing pens to farrow, their feed at that time should be reduced about one-third because of their lessened activity. In addition, a pound of wheat bran or ¼ pound of linseed meal fed to each sow daily will help to overcome any tendency to constipation that sows may show while they are confined to small pens. Care must be taken not to overfeed linseed meal as it may result in the development of scours in the little pigs.

The day the sow is expected to farrow the ration should be

further reduced. Ordinarily she needs no feed for 12 to 18 hours after farrowing. Water from which the chill has been taken should be allowed freely.

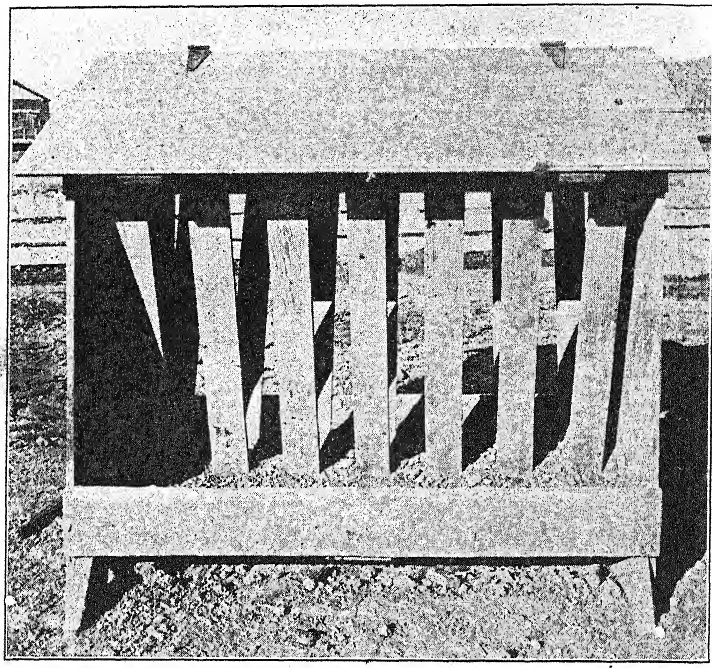
After farrowing the feeds should be increased very gradually. Greater care and more time are needed to bring a heavy milking sow or one with but a few pigs to full feed than one with a large litter or one that is a naturally poor milker. It can ordinarily be accomplished safely in from 10 days to 2 weeks.

(*c*) *Feeding Sows with Litters.*—In feeding sows with litters the aim should be to stimulate their milk flow as much as possible. To accomplish this the ration should be palatable, rich in protein, and low in fiber. Because of the beneficial effect pastures have upon milk production and the growth of little pigs, they are of primary importance during the suckling period. In absence of pasture ½ to 1 pound of good legume hay should be included in the ration.

The more palatable farm grains and many by-product materials can be used. Oats should be fed sparingly because of their bulk. The grains need not be ground except as a precaution, in the case of small grains, against their passing through the animals unutilized. Slopping sows, though very common, is not essential.

Supplementing farm grains with protein feeds is just as essential to high milk production in the sow as in dairy cows. The exact amount of protein required by sows during the suckling period has not been determined definitely by experiments, but practical feeding operations have indicated that 15 per cent, as suggested in Table 10, is probably as low as should be fed. Usually, sows will come through the period in better condition and with larger pigs if they are allowed a full feed of good protein supplement in addition to grain than if their protein supply is restricted. The average mature sow if allowed a full feed of grain and tankage will eat about one pound of tankage daily during the suckling period. A ration of one part of tankage to eight parts of corn contains about 15 per cent of protein.

Heavy milking sows will not become over-fat during the suckling period and others should not be permitted to. When pasture is not available the use of legume hay of good quality during gestation and lactation will prevent most of the trouble from sows "going down," or losing control of their hind legs.



Courtesy of University of Illinois

FIG. 59.—HAY RACK FOR HOGS

Legume hay of good quality fed in such a rack as this is an excellent addition to the dry-lot ration of pregnant sows.

(*d*) *Feeding Boars.*—During the breeding season boars should be fed enough of a well-balanced ration to keep them thrifty and in good condition, but not so fat as to be awkward in service. Pasture is excellent at this time. In dry lot, legume hay of good quality should be fed.

When not in service, mature boars need little other than good pasture in summer, or alfalfa hay and a light feed of farm grains during the winter. Boars that are still growing should be fed liberally enough to permit them to grow as they should. Opportunity to exercise should be given at all times. Water and salt should also be available.

(e) *Developing Pigs for the Breeding Herd.*—Prospective breeding animals may remain with the pigs that are to be fattened until they weigh 75 or even 100 pounds. From this time on pigs that are intended for the breeding herd should be fed a ration that is richer in protein and mineral matter than is necessary for fattening pigs, since growth rather than fat is desired. Because extremely rapid gains are not essential in developing breeding animals, oats can be used freely in their ration. Pasture or good legume hay should always be included. Enough of the other farm grains and protein supplements should be fed to insure satisfactory thrift and condition at all times. Water and salt are of course necessary.

5. Feeding Growing, Fattening Pigs.—Fattening pigs should be considered factories for converting feed into pork. Any condition that will speed the process or make it more efficient should be provided. Because pigs gain during the suckling period more cheaply than at any later time, the milk production of the sow has a direct influence on profits. It is likewise important that the pigs have a generous supply of suitable feeds as soon as they show any interest in eating. Pasture is very helpful in giving pigs a better-than-average start.

Before weaning, the ration for pigs need not be complex for good results. Shelled corn or other palatable farm grain, such as cracked barley or wheat, and a good protein supplement offered in a self-feeder in a creep is a simple yet satisfactory ration. Suckling pigs show a preference for shelled corn over many other feeds and prefer it to ground corn. Wheat middlings and whole and finely ground oats are eaten less readily. As long as pigs are nursing they will not eat a great deal of supplement. With it available, however, they are able to

obtain their needed protein there as the milk supply declines. By weaning time they have come to depend so much on the self-feeders that they scarcely miss their mothers.

Following weaning, the same or similar feeds should be supplied in the self-feeder. It should always be kept in mind that for most rapid gains the fiber content of the ration should be kept low. The data in Table 11 show the changes in feed consumption and gains that are characteristic of pigs as they increase in weight. These figures are taken from feeding tests in dry lot in which the ration consisted of corn and supplement in separate compartments of a self-feeder. The amount of corn eaten increased rapidly as the pigs increased in weight. The daily supplement consumption increased until they reached a weight of 125 pounds and then gradually decreased.

TABLE 11

SUMMARY OF FEED CONSUMPTION AND GAINS OF PIGS OF DIFFERENT WEIGHTS SELF-FED CORN AND SUPPLEMENT FREE-CHOICE IN DRY LOT

(Weights Expressed in Pounds)

Number of Pigs	Average Weight	Range in Weight	Average Daily Feed			Percentage Protein in Ration	Average Daily Gain	Feed for 100-Lbs. Gain
			Corn	Supplement	Total			
778	74	50–100	3.23	0.86	4.09	18–15	1.12	365
838	124	100–150	5.40	0.97	6.37	15–13	1.49	428
685	174	150–200	6.85	0.73	7.58	13–12	1.69	449

Summarized from feeding trials conducted at the Illinois Agricultural Experiment Station.

When the feeding is being done on good pasture the percentage of protein in the remainder of the ration may be decreased by 1 or 2 per cent.

It is interesting to note that pigs lighter than 75 pounds in weight actually ate more protein supplement per head daily than they did when they weighed 150 to 200 pounds. The greatest amount was eaten between weights of 90 and 130 pounds. Some of the groups of pigs of this weight ate more

than a pound of supplement daily per head. The proportion of supplement in the ration decreased rapidly as the pigs became larger, though their total protein intake in both corn and supplement increased steadily. The percentage of protein in the ration, on the other hand, decreased from 18 per cent for the 50-pound pigs to 12 per cent in the ration of the 200-pound pigs.

It is evident from the table that larger pigs gain more rapidly than smaller ones, but that their gains require more feed.

These figures represent the results of allowing a fairly large number of pigs to balance their own rations. While they cannot be taken as an exact statement of the protein requirements of pigs at different weights, they can, in absence of knowledge along this line, be considered as representing the approximate needs of pigs for satisfactory gains.

It is very evident, as pointed out earlier (page 223), that under most conditions it will pay to feed some good protein supplement with the common farm grains to fattening pigs. The self-feeder is particularly well adapted to the feeding of fattening pigs. Experiments have shown that when corn, and in large measure when barley, wheat, and similar grains of good quality are offered free-choice, pigs can be depended on to select approximately the proper amount of tankage or other suitable supplement to balance the ration. Moreover, the same feeds can be used from the time the pigs first begin to eat until they are ready for market, and as the bodily needs change with increasing weight they will voluntarily change the proportions of the grains and supplement eaten, as shown in Table 11. This method of feeding when applied to large droves of pigs results in the saving of much time and labor. A suitable water supply near the feeder and access to salt at all times are essential for best results. The efficiency of this simple method of feeding has been shown by numerous records of ton litters having been produced by it with as few as nine and ten pigs in the litter.

6. Considering Miscellaneous Problems.—Of the many remaining problems associated with feeding swine only two will be referred to briefly.

Considerations:

(*a*) Making use of self-feeders.
(*b*) Feeding to avoid soft pork.

(*a*) *Making Use of Self-feeders.*—The self-feeder is a device for automatically keeping a constant supply of feed available. Its use, therefore, is limited to animals that are being full-fed, such as fattening hogs and sows with litters. Its use can be extended to the feeding of sows during gestation and to the feeding of any hogs on limited feed by using a ration in it that contains as much as 11 to 13 per cent of fiber.

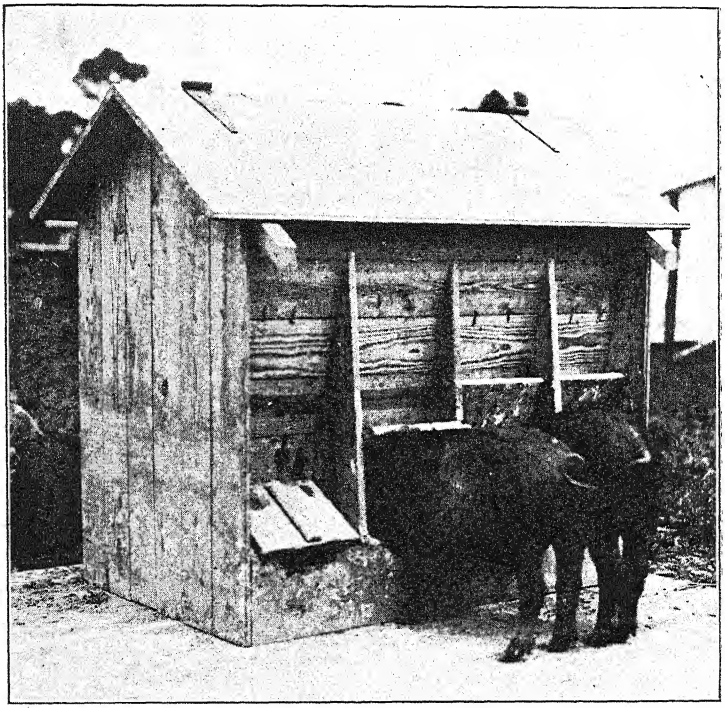
The principal advantage of self-feeders in pork production is the great saving in labor that accompanies their use. They are distinctly advantageous with large-scale operations. A further advantage is the fact that where the common farm grains and suitable supplements are supplied in separate compartments of the feeder, pigs often balance their own rations to better advantage than would be done for them. Also, pigs eat more feed when it is constantly available than they do if fed only twice a day. This larger consumption of a better balanced ration results in more rapid and economical gains.

For satisfactory results with the free-choice method of feeding a supply of both the grains and the supplement should be available to the pigs at all times; otherwise their gains are reduced because they are forced to eat abnormal amounts of one feed or the other.

The self-feeder is not a substitute for personal attention. It should be visited at least once a day to make certain that it is functioning properly. "The eye of the master fattens his cattle" applies just as truly when self-feeders are being used as when hand-feeding is practiced.

(*b*) *Feeding to Avoid Soft Pork.*—Soft and oily hogs have been known on the American market since the early days when

mast-fattened hogs (hogs fattened on nuts and acorns) were common. While all the factors responsible for soft carcasses are not known, certain feeds that are rich in oil have been



Courtesy of University of Illinois.

FIG. 60.—A HOME-MADE SELF-FEEDER

A self-feeder of good design and construction, such as the one shown here, saves much labor in feeding fattening pigs. Self-fed pigs usually gain more rapidly than hand-fed pigs.

proved definitely to be responsible for some of this trouble. The responsibility of peanuts in this connection is well known and their use in the South accounts in great measure for the discrimination of northern markets against southern fat hogs.

In recent years the number of soft hogs appearing on corn-belt markets has increased greatly. The rapid increase in the acreage of soybeans is thought by many to be responsible for this. Undoubtedly soybeans have been a factor, since careful tests have shown that if they are used as the principal source of protein in the ration of fattening pigs the carcasses produced are soft.

Soybean oil meal does not have the undesirable effect on the quality of pork that is produced by soybeans. Experiments have shown it to be a valuable source of protein for all classes of swine.

It seems likely that another contributing cause is the popularity of the rangy-type hog. Fat makes up a smaller proportion of the increase in weight of the rangy animal than it does of the animal of thicker type. The rangy animal, therefore, frequently lacks finish when it is marketed, and lack of finish is known to be a factor in soft carcasses.

FARM STUDIES

1. Determine the weight per bushel of the oats in as many bins as you can find on your own and your neighbors' farms. To do this, weigh an empty bushel measure and then weigh it level full of oats. Do not crowd or shake the oats down; merely pour them into the measure and stroke them off level with the top with a straight edge.

If a chemical balance is available, shell out from 200 to 300 kernels each of the heaviest and the lightest oats, being careful not to lose any of the kernels or hulls. Have the kernels and hulls of each sample weighed separately on the balance and compute the percentage of hulls in the oats. How many pounds of hulls are there in a bushel of these oats? What effect would this amount of hulls have on the feeding value of the oats?

2. Compute the cost of a pound of protein in a number of protein feeds that are available in your neighborhood. In doing this use the table of feed compositions in the appendix, the guaranteed composition of any commercial feeds, and local prices of all feeds.

3. Place a number of different feeds, such as shelled corn, ground corn, whole and ground oats, wheat middlings, etc., in a creep for sucking pigs. Observe the amounts of each feed eaten.

4. Observe carefully a number of litters of sucking pigs and see at what age they begin to eat.

5. In connection with your shop work make a self-feeder from plans obtained from your state experiment station.

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NOTE. See also references in Chapter VII.

PART III.—MANAGEMENT

CHAPTER XIII

MANAGING LIVESTOCK

THE profitable production and maintenance of livestock must rest on a foundation of land and a farming system and equipment suitable for the purpose. Not only must animal health and comfort be assured through proper feeding and sanitation, but the meat, milk, and wool must be produced and

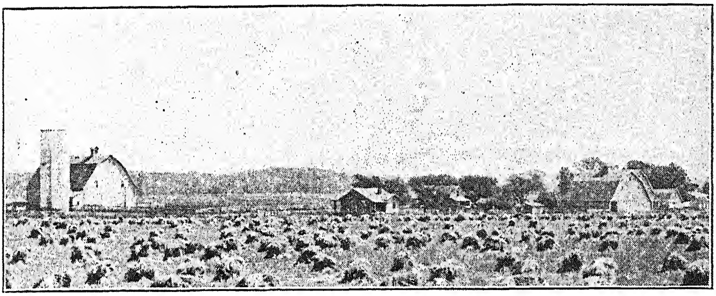


Photo by Allen

FIG. 61.—BARNS AND SILOS ON A WELL-MANAGED LIVESTOCK FARM

Good crops of small grain provide feed and bedding and also serve as nurse crops for grass and clover seedings. Owner, Murdock Farm.

the animal power obtained at an average cost which will yield a profit. "The dollars and cents basis will always be a real one." Expenses cannot be disregarded. The land, animals, and equipment, each of them, must be "rent-payers." Good methods usually assure at least moderate profits. Larger profits are sometimes made by the exceptional manager. Many good farm homes have been built and many families well

educated by the profits from the livestock enterprise of the farms.

Livestock must be considered in its relation to the farm business as a whole and not entirely as a separate unit. The reciprocal relations between farming and animal husbandry improve in many important ways the chances of each for success. All the operations must be well balanced and each item given due and regular attention. It is not possible to succeed without a sound general plan. Neither can the manager hope for success unless the necessary jobs, "big and little," are punctually performed as a matter of faithful, habitual routine. Production costs and markets have to be skillfully judged and kept in line. The rules are not "cut and dried." No one system of management is of general application. There is much need for thought and study of individual successes and failures.

Management Factors:

1. Providing and caring for pastures.
2. Managing livestock on pasture.
3. Planning buildings.
4. Securing and maintaining healthy livestock.

1. Providing and Caring for Pastures.—Pastures are of fundamental importance in livestock farming. By skillful management they may be the means of reducing feed and labor requirements as well as fertility charges. Good pasture provides animals with the opportunity for exercise, sunshine, fresh air, and healthful feed—the proteins, minerals, and vitamins necessary for growth and reproduction. The young, tender grass plants rival the legumes in protein content. Without pasture healthy breeding studs, herds, and flocks are practically impossible.

Permanent pastures furnish feed early and late in the season, although during the driest and hottest weeks of the summer they usually dry up. There is little or no expense for seed or seed-bed preparation. Where bluegrass and little white clover

grow well, they are the stand-by crops for permanent pasture. Bluegrass, after it is well established, makes a turf which withstands much tramping. Redtop is a very useful grass plant to sow in permanent pasture mixtures. Orchard grass, thickly sown, stands much abuse from dry weather and heavy grazing.

Rotation pastures contain legumes more often than per-

Photo by Sutcliffe *Courtesy Horse Association of America*

FIG. 62.—EXCELLENT BLUEGRASS PASTURE ON FAMOUS THOROUGHBRED BREEDING FARM IN KENTUCKY

Owner, Col. E. R. Bradley

manent pastures; they stand drouth better, and they frequently make more growth and furnish more feed. The surplus, if any, may be made into hay. Since these pastures are included in the rotation more attention is likely paid to fertility than is the case with permanent pastures. Sweet clover, alsike, red clover, alfalfa, and timothy seed in varying proportions are usually used for seeding. If hay is to be made, sweet clover should not be included; otherwise it should form

a large proportion of the seeding. The use of alfalfa as a pasture crop for both hogs and cattle is increasing steadily. Rotation pastures are best used to supplement permanent pastures. Each type of pasture should be used for the purpose it serves best.

Emergency pastures are occasionally necessary on many farms. Sudan grass, rape, and the small grains are all used for this purpose. Sudan grows well in hot weather and makes an abundance of feed. Rape seeded early on fertile soil produces an immense yield of succulent forage for sheep or hogs. It is sometimes seeded in spring-grown grain and in cornfields where they are to be "sheeped-" or "hogged-down." In the case of cattle, silage may be provided to take the place of bare pastures.

Procedure:

(*a*) Sow liberally on well-prepared seed-bed.
(*b*) Maintain or improve fertility.
(*c*) Keep in sanitary condition.
(*d*) Cut weeds and briars.
(*e*) Use care in grazing.
(*f*) Alternate use of pastures.
(*g*) Use different classes of livestock at the same or different times.

(*a*) *Sow Liberally on Well-prepared Seed-bed.*—In preparation for seeding a pasture the soil should be made fertile and the seed-bed should be clean and well compacted. For permanent pastures mixtures of several varieties of grass and clover seeds usually furnish more feed and result in a better turf than the use of a single variety.

A simple method of reseeding bare spots on permanent pastures is to feed hay on them. Pastures which have become run down may require plowing, cropping, and reseeding for their renewal.

(*b*) *Maintain or Improve Fertility.*—It is impossible to grow good pasture, either permanent or rotation, on land depleted in fertility. In permanent pastures improving the fertility

does much to bring in valuable grasses and clovers and also other desirable pasture plants which will not grow on impoverished soils. A fertile soil increases the amount of herbage and extends the length of the pasture season.

(c) *Keep in Sanitary Condition.*—In order to keep pastures fresh and sanitary the droppings should be spread and thus exposed to the sun. This practice also more evenly spreads the fertility. For this purpose a peg-tooth harrow should be used or preferably an English grass harrow. The harrowing should be done whenever the livestock is removed to rest the pasture. Using a roller in the spring is a good practice when the surface permits.

(d) *Cut Weeds and Briars.*—During midsummer the weeds and briars should be cut with a mowing machine if the topography of the pasture will permit. Poisonous or otherwise particularly objectionable weeds should be cut or dug out if necessary.

(e) *Use Care in Grazing.*—Do not pasture too early in the spring. Grass should be four or five inches tall when the stock is first turned on. Graze heavily enough to keep the grass growing and fresh; to overgraze, however, would soon result in the pastures becoming weedy. During the hot summer months, especially, do not let the livestock "grub" the pastures. It is also essential that pastures should not be grazed too late in the fall. Considerable leaf surface is necessary for successful wintering and an early start in the spring, and some seed should be allowed to mature in order to help maintain the stand. In the case of newly seeded permanent pastures close grazing is ruinous. They should be grazed only moderately or better still cut for hay for one or even two years.

(f) *Alternate Use of Pastures.*—Give pastures an occasional rest. Grazing them the year around is ruinous. By alternating the use of permanent and temporary pastures the sods of both may be saved. Rotation pastures with their legumes are particularly useful during the hot, dry spells of summer when bluegrass pastures are dried up.

(*g*) *Use Different Classes of Livestock at the Same or Different Times.*—The grazing habits of farm animals vary considerably. Cattle eat coarse grass better than do horses or sheep and as they graze the herbage more evenly they are not so likely to leave the pasture bare in spots. Horses and cattle usually graze well together. Sheep will eat many different kinds of weeds which are not palatable to cattle or to horses. They scatter their droppings and tend to leave them on the higher points in the pasture. In a pinch, sheep and work horses or brood-mares may graze in the same field. Sheep and colts or mules cannot be safely entrusted together. Horses do much damage to the sod when the footing is soft. Hogs should follow cattle which are being fattened with whole grain on grass.

2. Managing Livestock on Pasture.—

Procedure:

(*a*) Do not overstock the pasture.
(*b*) Use care in turning stock to pasture.
(*c*) Use supplementary feed when necessary.
(*d*) Provide shade for comfort.
(*e*) Inspect frequently.

(*a*) *Do Not Overstock the Pasture.*—The carrying capacity of pastures varies greatly. In the corn belt about two acres of good, permanent pasture will ordinarily carry a mature cow or horse throughout the season. If the grazing is exceptionally good one acre of either permanent or rotation pasture should be sufficient. Regulate the number of livestock according to the feed produced rather than the acreage.

(*b*) *Use Care in Turning Stock to Pasture.*—Livestock, ordinarily, should not be suddenly changed from dry feed to pasture. It is better to accustom them to it gradually. In any event they should be given all the good, dry hay they will eat before being turned out. The pasture, particularly if a legume, should be dry at the time of turning out, because bloating is more severe when the plants are wet with dew or

rain. Stock being turned on a legume pasture should first be given a good fill on bluegrass. Cattle and sheep are more likely to bloat than horses.

(c) *Use Supplementary Feed when Necessary.*—During midsummer, when the pastures are not at their best, supplementary feed may be required. Such feeding should start in time and never be delayed until both livestock and pasture have suffered severely.

(d) *Provide Shade for Comfort.*—If there are no trees in the pasture, artificial shade of some sort should be provided for the comfort of the animals. Livestock will not thrive when constantly exposed to the blistering sun without protection. Shade also affords some protection from flies and other insect pests.

(e) *Inspect Frequently.*—All livestock should be frequently inspected while on pasture. Valuable animals should be seen once or twice each day. Care must be taken to make sure that the water supply is abundant and of good quality, and that block salt is always available.

3. Planning Buildings.—If livestock are to be kept healthy and vigorous it is important that the farm buildings and equipment be adequate, comfortable, and sanitary. Providing proper protection in winter against cold and storms, and in summer against heat and insects, is a profitable investment if it is intelligently and economically planned.

To be efficient, farm buildings need not be elaborate or expensively built. In fact very few such buildings can be profitably used. Comparatively inexpensive plain buildings may be very satisfactory if they are carefully planned. All flimsy, slip-shod construction should be avoided, as it adds greatly to the annual cost of upkeep. Good reinforced concrete foundations and good roofs cut down expenses.

The layout of farm buildings is of great importance. Barns and lots should be two hundred feet or more from the house and should not be in the direction of prevailing summer winds. This is for protection from odors and fire. They should also be located with reference to convenience in reaching fields and

the road. Long lanes should be avoided as they are wasteful of time, fertility, land, and fencing. The width of the lane should depend upon the size of the herds and flocks. The main service drive should be some distance from the house.

The buildings should be located on well-drained ground and preferably on a slight elevation which slopes to the south or east. Poor drainage and sanitation do not go together. If an elevation is not available it is good economy to spend considerable effort and money in grading up to the buildings.

The arrangement of barns and lots is a large factor in the labor costs of housing animals. When there are several buildings they should be located around a spacious court, both for convenience and protection. The barn, especially, should be located so that it will serve as a windbreak for the lots and other buildings. Trees and shrubbery may be planted to serve as windbreaks and shade and also to screen unsightly portions of buildings and lots.

Considerations:

(*a*) Barns.
(*b*) Sheds and covered barnyards.
(*c*) Hog houses.
(*d*) Pavements and feeding-floors.
(*e*) Silos.
(*f*) Grain storage.
(*g*) Watering equipment.
(*h*) Fences.

(*a*) *Barns.*—A rectangular shape is best suited to most barns. The width of the barn should permit either two rows of tie stalls or one of box stalls and one of tie stalls. A barn 34 or 36 feet wide is well adapted to all kinds of farm animals. The most economical use of floor space and the most convenient plan for doing chores is to have the stalls facing out with a driveway between them which is wide enough to accommodate a manure spreader. Manure and bedding can then be directly handled and the cost of carrier equipment avoided. The

length of the barn should usually run north and south. This permits a more even distribution of sunlight, which makes for cleanliness and sanitation.

Pole barns with lean-tos are satisfactory for beef cattle. The mow in the center extends to the floor, which may be earth. This style of barn gives a large capacity and convenient location for hay and straw. The cost of construction is relatively low.

Gambrel and Gothic roofs give more space for hay and straw storage than do straight gable roofs. Space is also con-

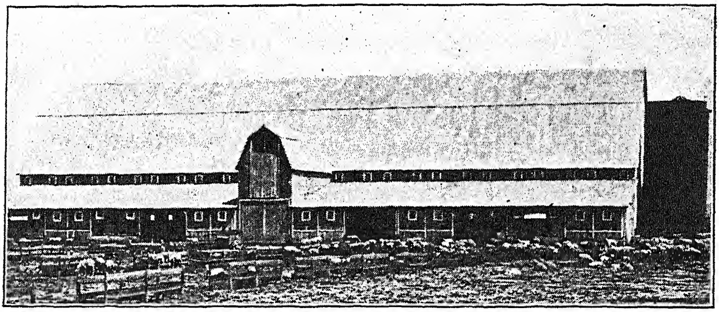


FIG. 63.—LARGE, CHEAPLY CONSTRUCTED BARN SUITABLE FOR SHEEP OR BEEF-CATTLE FEEDING

The mow will store large quantities of roughage, conveniently located for feeding. Owner, Paul Murray.

served for storage through the doors being located in the ends of the mow.

Doors and windows, hinged at the bottom and opening into metal guard shields at the side, may well serve for ventilation except in the case of high-producing dairy cattle which spend most of their time in the barn during cold weather. Under these latter conditions a well-planned and carefully built ventilating system, such as the King system or some modification of it, may be installed. In the case of valuable livestock, numerous doors are advisable as they add greatly to the possi-

bility of saving the animals should there be an outbreak of fire.

(*b*) *Sheds and Covered Barnyards.*—Sheds with roofs only will provide the necessary shade very satisfactorily in pastures that do not have trees. Rotations and the distribution of fertility suggest that they should be easily movable either as a

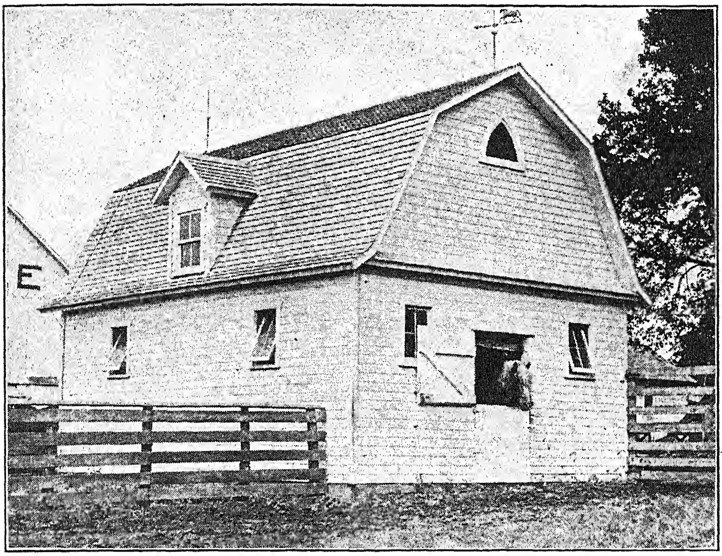


Photo by Allen

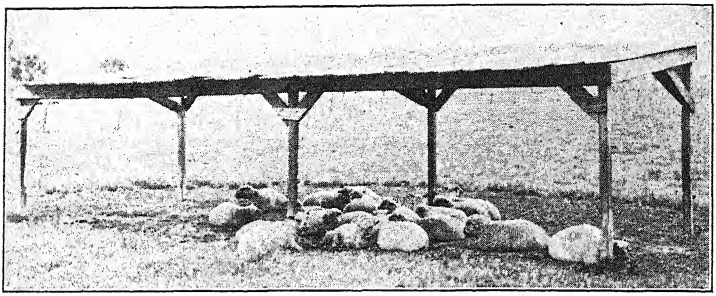
FIG. 64.—STALLION BARN

A separate barn is considered safer for the stabling of valuable sires. Owner, C. G. Good.

whole or in sections. Wire fencing supported by a frame and posts, and covered with straw or weeds, will make both cheap and satisfactory shade.

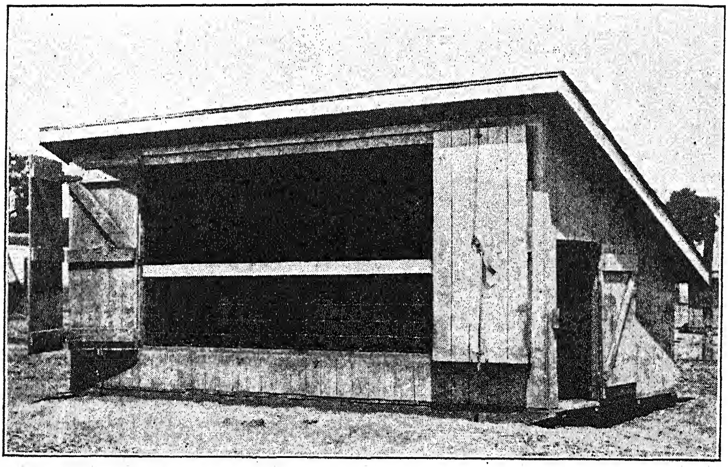
Sheds with a roof and three sides, the open side to the south or east, are satisfactory for many classes of livestock. They furnish sufficient shelter for fattening cattle and lambs, dry cows, ewes (except at lambing time), and idle horses. Movable

sheds should be well braced in order to stand moving. If the timbers coming in contact with the soil are treated with



Courtesy of University of Illinois

FIG. 65.—CHEAPLY CONSTRUCTED SHADE FOR LIVESTOCK ON PASTURE



Courtesy of University of Illinois

FIG. 66.—DOUBLE-UNIT MOVABLE HOG-HOUSE

This type of house is easily arranged to admit air and sunshine. It is also readily cleaned.

wood preservative, many years will be added to their service.

Covered barnyards find favor with many practical stock-

men. In them cattle may run loose to hay and water, and also to grain when self-feeders are being used for fattening them. Milk cows are fed grain when they are put in stalls for milking. During severe winter weather, however, open sheds do not furnish sufficient protection for very heavy milking cows.

(c) *Hog Houses.*—Expense should be carefully considered before capital is invested in a costly central hog house. Many economical pork producers favor the small individual hog houses. They have an advantage over the central hog house not only in being far less costly, but also in making it much easier to maintain the necessary sanitary conditions, for they can be moved from field to field as desired.

(d) *Pavements and Feeding-Floors.*—In all sections where the winters are likely to be at all open, concrete lot pavements and feeding-floors save feed, aid sanitation, and add comfort to such an extent that they will save more money than almost any other sort of barn or feed-lot equipment which could be provided. Moreover they save fertility as well as feed. Feeding-floors and other paving should be protected at their edges by walls extending below the frost-line. These walls save the pavement and keep out vermin.

(e) *Silos.*—Silos are increasing in popularity with thoughtful feeders. They furnish economical storage for valuable feed and add flexibility to feeding operations. After the silo is opened, at least two inches in depth per day must be used in order to prevent spoilage. For summer feeding it is usually advisable to use silos relatively small in diameter so that there will be as little spoilage as possible.

When their initial cost can be afforded, monolithic concrete silos are usually cheapest and generally the most satisfactory over a long period of years. Good useful silos are made of clay tile, cement block, staves of wood, and occasionally of metal. Cheap temporary silos are satisfactorily made of wooden picket corn-crib fencing lined with roofing paper. These silos are best made 20 feet in diameter and not more than three tiers of fencing high. The top tier is set inside the lower as filling takes

place. The silage should be evenly distributed to permit even settling, and since the silo is not high, it should be well tramped. A hoop of heavy wire and a small turnbuckle will help to reinforce the middle of the pickets.

(*f*) *Grain Storage.*—Livestock farms require safe, convenient, rodent-proof storage for grain. In addition, storage is frequently needed for purchased concentrate feeds.

A combination corn-crib with small-grain storage above and floor space below for storage of bagged feed is favored by many feeders. The use of an elevator for filling cribs and bins —drag-belts for ear-corn and gravity down-spouts for small grain—eliminates much hand labor. If corn crushers and grinding machinery are used, they should be located in close proximity to the grain supply and if possible the bins should spout into their hoppers.

Portable bins of metal or wood may be used to store feed close to the point where it is to be used. Self-feeders for hogs, cattle, and occasionally sheep may be built to hold several days' or even weeks' supply of feed. Substantially built, weather-proof, and constructed after a good pattern, these feeders serve a useful purpose and save considerable labor. None exist which do not require at least brief daily inspection.

(*g*) *Watering Equipment.*—No farm can be considered a good stock farm which is not well watered. Running water in pastures usually adds greatly to their value. Water under pressure in barns and lots is one of the most valuable of all conveniences to the stockman. It is essential that the supply be adequate. For a horse, mule, or cow, 12 gallons a day should be allowed, and for a sheep or hog, 1 gallon per day. Where water is used for cleaning purposes, still more, of course, will be required.

Drinking troughs should be located conveniently. They should never be put in cramped quarters, such as fence corners. This applies particularly to troughs used by horses, for not infrequently horses do considerable damage to each other when running loose to poorly located troughs. A well-reinforced

concrete trough, sloping on the inside and surrounded by several feet of roughened concrete paving, is very satisfactory. Floats and valves for regulating the water level make for less labor. A valve for emptying and an over-flow pipe facilitate the keeping of troughs clean. In winter a tank heater should be used to keep ice from forming.

Horse barns may well be equipped with a conveniently located trough. Dairy cattle when stabled are most satisfactorily watered by the use of individual drinking cups. For hogs which are being pastured in fields having no water supply, the use of portable water tanks, mounted on wheels or runners, will be found a convenience.

(*h*) *Fences.*—The profitable use of permanent pastures and the rotation of crops and livestock necessitate considerable fencing. The maintenance of good fences helps to insure the good will of neighbors for the livestock farmer. Line-fences and main field fences, of course, should be permanent in character but for some purposes the use of temporary fencing is usually good economy.

Board fences, because of the original cost of building them and the cost for repairs, are obsolete except for small exercising paddocks. They may be made safe, strong, and durable for this purpose. For most classes of livestock, fencing of woven wire 47 inches wide and with a barb-wire on top, is satisfactory. Six-inch stay-wires are necessary to make a pig-tight fence. Twelve-inch stays are satisfactory where only horses and cattle are pastured. All No. 9 wire in a woven-wire fence adds to permanency. For temporary fence which has to be moved in the seasonal changes the use of lighter weight wire is advisable, as it is more easily handled.

Barb-wire tightly stretched is largely used for fencing areas of cheap grazing land. Three strands are sometimes used; four are more satisfactory. This type of fence is more suitable for cattle than for horses. It is a dangerous fence for horses, occasioning severe losses in numerous instances.

Posts may be of wood, steel, or concrete. Creosoted,

softwood posts are enduring. Some of the soft woods, such as red cedar, have an enduring heartwood and make very satisfactory posts when this heart-wood is of sufficient size. Osage-orange will outlast all other wood posts. Iron and steel posts are quickly set and make an attractive fence. The use of one-third wooden posts helps to stiffen up a line of metal posts. Concrete makes a strong, permanent corner post. In large fields good posts set a rod apart are sufficient; in small enclosures they should be set not more than 8 or 10 feet apart to insure strength. The life of a wire fence is largely dependent upon strong, well-braced corners which will stand a heavy pull.

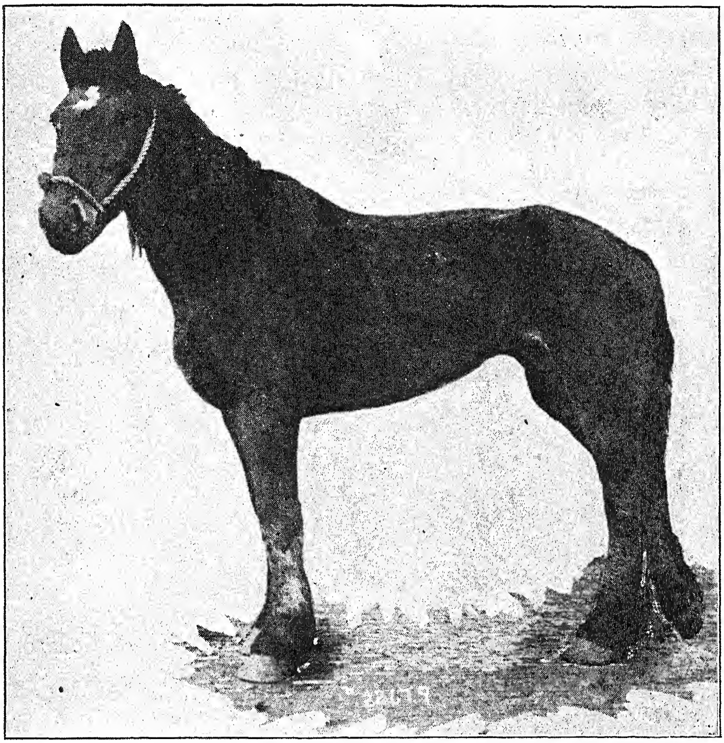
Fences around bull paddocks should be not less than 5 feet high. The use of 2″ × 6″ or 2″ × 8″ planks spiked or preferably bolted to heavy posts makes a good fence for this purpose. Pipe or used boiler-flues fastened by U-bolts or run through concrete posts make a secure, lasting, and good-looking bull paddock. Bulls should not be enclosed by fences which do not permit their seeing what is going on outside. An easily climbed fence favors the attendant in case of trouble. These pens are safest when they contain a safety breeding-stall which is protected by a heavy gate. The pen should have adjoining shelter.

The strongest and safest stallion paddocks are made of heavy galvanized 2-inch mesh, chain-link fencing, woven from No. 9 wire. Fence for stallions should be not less than 7 feet high and the posts not more than 10 feet apart. The bottom of the fence should be 8 to 12 inches from the ground. Exercise paddocks should be rectangular in shape, not square, and two to four times as long as they are wide. Valuable sires merit paddocks sufficiently large to afford some grazing.

4. Securing and Maintaining Healthy Livestock.[1]—The health of farm animals is important not only because of its relation to profits, but also because of its close relation to human

[1] This discussion is based on lectures to Animal Husbandry students at the University of Illinois, by Robert Graham, B.S., D.V.M., Professor of Animal Pathology and Hygiene.

health. Tuberculosis in cattle, hogs, and poultry, infectious abortion in cattle and hogs, glanders in horses, and rabies in dogs and other animals, are only a few of the animal diseases



Courtesy of University of Illinois

FIG. 67.—ADVANCE SYMPTOMS IN HORSE SUFFERING FROM FOUR DIFFERENT SPECIES OF INTERNAL PARASITES. (Ill. Agr. Exp. Sta. Cir. 378.)

which are communicable to man and must be controlled for his protection.

There is no single profit-limiting factor in livestock production which is more important than disease. Diseased animals or those heavily infested with parasites are seldom if ever

commercially profitable. Feed given to them is to a considerable extent wasted. Too few farmers realize that modern veterinary science has developed highly satisfactory methods of controlling most animal diseases and that it is far cheaper to keep diseases out of the herd than it is to treat diseased animals. Even with preventive measures skilled veterinary treatment is of course sometimes necessary. The capable veterinarian has a very important place in his community from the standpoint of both prevention and treatment.

Procedure:

(*a*) Select sound, vigorous foundation stock.
(*b*) Quarantine all new purchases and also any ailing members of flocks and herds.
(*c*) Feed proper rations.
(*d*) Plan for out-door exercise, and avoid overcrowding.
(*e*) Practice sanitation.
(*f*) Immunize for protection when possible.
(*g*) Plan for all-round animal comfort.

(*a*) *Select Sound, Vigorous Foundation Stock.*—In starting a breeding herd and continuing throughout the enterprise, select only vigorous, healthy productive animals, and select them only from healthy herds, flocks, and studs. Some risk may be avoided by purchasing young animals. There is a decided advantage to the owner of healthy stock if he can breed in his own herds such additions as he may require from time to time, with the possible exception of an occasional sire.

Never buy a breeding animal which is not free from disease by all the known reliable tests.

(*b*) *Quarantine All New Purchases and also any Ailing Members of Flocks and Herds.*—Quarantine all new purchases and also any individuals on the farm which develop suspicious symptoms. This is absolutely essential to prevent the possible spread of disease and parasites. Livestock establishments of any size should have a special quarantine barn or shed and lots. Maternity stalls are a valuable and necessary means of disease

control in some herds. Foresight, the ability to anticipate trouble early before it has reached proportions of any size, is a most valuable asset for any caretaker to possess. This faculty is partly a natural gift and partly the result of a long and close association with a particular class of livestock.

(c) *Feed Proper Rations.*—Feed balanced rations made from sound feeds and feed them regularly and in moderation. Avoid sudden changes in amounts and kinds of feeds. Unnatural forcing for show or for high records is always more apt to be accompanied with losses from disease than is the case under more moderate systems of feeding.

Care must be taken to see that rations are not lacking in any of the food elements which are essential to health. Among the diseases caused by food deficiencies are rickets, posterior-paralysis in pigs, leg weakness in chickens, loin disease in cattle, osteoporosis, or big-head, in horses and sheep, and anemia in young pigs.

Feeds may contain preformed poisons, such as the ray fungus, which causes lumpy-jaw in cattle; ergot in rye and other grasses, which may cause abortion; botulism, which causes forage poison; moldy sweet clover, the feeding of which may lead to death by hemorrhage (second-year sweet clover is not a desirable hay crop), and hydrocyanic-acid poisoning from second-growth and frosted cane and sudan grass. Certain plants are poisonous to animals; for example, cocklebur sprouts, white snakeroot, whorled milk-weed, waterhemlock, wild cherry, and black locust bark. Stock is most likely to eat these plants when good pasture grass becomes scarce.

Feed may be contaminated with infective material and so spread contagious diseases and parasites. Tuberculosis, infectious abortion, paratuberculosis, necrotic infection in swine, and numerous parasites may be passed from the carrier animal to the healthy one by means of contaminated feed.

(d) *Plan for Out-door Exercise and Avoid Overcrowding.*—Out-door exercise adds greatly to the life and health of breeding animals. It is only during brief fattening periods and bad

weather that it is advisable to limit exercise. The housing equipment, lots, and pastures should be adequate for the size of the herds and flocks. Practically always it is more profitable to keep a smaller number of animals under healthful conditions than to attempt to care for a larger number with inadequate provisions for housing and exercising.

(*e*) *Practice Sanitation.*—Sanitation, which means plain cleanliness and includes all measures which keep disease away, is of the utmost value to stockmen in preventing both disease and parasites. Disease is almost always found where sanitary conditions are bad. Probably 90 per cent of the diseased herds and flocks exist in filthy surroundings. No medicine can take the place of cleanliness.

Clean all stables and lots regularly and use only fresh pastures in a sanitary condition. Haul manure daily from closed barns to the field; this aids sanitation and greatly adds to the saving of fertility. Super-phosphate used in the stalls and gutters of the cleaned cow-stables, at the rate of 1½ or 2 pounds per head per day, and covered with straw, adds to stable sanitation and saves ammonia. One ton of phosphorus-reinforced manure may be worth 2 tons of ordinary manure in fertility value. When it is not possible to haul the manure daily to the field, store it in a manure shed. If super-phosphate is not used in the barn, add it to the stored manure at the rate of 40 to 50 pounds per ton. Droppings must be regularly removed from small lots, pavements, and feeding-floors. Where the terrain permits, droppings on the permanent pasture fields of the farm should be spread by harrowing and thus exposed to the sun as previously explained.

Plowing and cropping tend to free soil from infective material. Pastures in the rotation, therefore, will be freer from danger than permanent pastures. Rotate the livestock to clean ground; rotation of livestock is at least fully as important as that of crops. The value of using clean pastures in keeping down infestation with round-worms is exemplified by the McLean County system of swine sanitation.

Burn dead carcasses and other infective material. This is a much safer means of destroying infection than burying. To expedite burning, dig trenches at right angles and use iron supports across the trench to support carcasses and wood. If burying is practiced the carcasses should first be covered with quicklime.

All buildings which house livestock should be thoroughly cleaned and disinfected annually. It is of particular importance that maternity stalls be scrupulously cleaned each time before using. First remove the manure and other debris; scrape the floor and walls with a sharp spade or a hoe with a straightened-out shank; sweep, and then scrub thoroughly with a boiling-hot lye solution. Use a 1-pound can of lye for 20 to 30 gallons of water. Pens and buildings cleaned in this manner should be exposed to the sun and air whenever possible. Direct sunlight itself is a powerful destroyer of germs.

Compound creosol (U.S.P.) in a 3 per cent solution (4 ounces to 1 gallon of water) or its germicidal equivalent, is effective for spraying barns and sheds. Coal-tar dips are more effective when mixed with soft, hot water. If the water is hard, first soften it by adding plenty of washing soda. Solutions of coal-tar dips are efficient only so long as they remain in emulsion.

In the control of parasites, such as ticks and mites, it is often necessary to use dips. Sheep should always be dipped soon after shearing. Suitable preparations may be purchased commercially and these may be applied by hand, by spraying, or by the use of a dipping tank. The first two methods are applicable only to small numbers of cattle, hogs, and horses. When applying by hand, the dip may be poured from a wide-mouthed bottle while it is being vigorously scrubbed in with a brush. Particular attention should be given to portions between the legs and round the head. Spraying in most instances is not a suitable method to use as it is difficult to cover thoroughly all parts of the animal's body in this way.

The use of dipping tanks is easily the most effective method of treatment. The water should be warm, though not over

blood heat. This will mean less shock to the animals and a better pentration of the dip; also, the warm water dissolves dirt and oily substances on the skin better than cold water. Dipping in cold weather is extremely dangerous to animals. The tank must contain sufficient dip to swim the tallest animals. They must be submerged twice, heads included, in passing through the tank. All livestock should be watered a few hours before dipping. During hot weather they should be allowed to rest afterwards in the shade or under shelter. Do not separate young from their dams for long at dipping time. Two dippings, the second following the first within 12 to 16 days, are required for a thorough job. Left-over dip may be used to spray around the barns and sheds.

(*f*) *Immunize for Protection when Possible.*—Protection from numerous serious diseases is practical through the use of the products of biological laboratories. One well-known example of such protection is the immunization of hogs against cholera. These laboratory products should be prescribed and used by members of the veterinary profession.

(*g*) *Plan for All-round Animal Comfort.*—The protection of the health of animals, combined with thoughtful, skillful feeding, careful housing, pasturing, and kindly treatment, makes for their comfort and results in real thrift. Only thrifty animals are profitable. In addition, the caretaker who looks out for the comfort of his animals will get a fuller measure of satisfaction out of his calling.

COMMUNITY STUDIES

Visit and study representative livestock farms in the vicinity of your school. It may be necessary in some instances to go further afield in order to see certain types of livestock farming which are not available locally. If the farms are carefully chosen this is a profitable course to follow.

1. Kind of land used for grazing:
   (*a*) Suitability for other agricultural use than grazing?
   (*b*) Fertility high enough to produce good yields if cropped?
   (*c*) Proportion of farm in grass? Why?

2. Permanent and rotated pastures:
   (*a*) Pasture crops commonly grown?
   (*b*) Methods of seeding?
   (*c*) Emergency pasture crops?

3. Methods of pasture improvement:
   (*a*) Most practical methods for improving old pastures?
   (*b*) Effect on carrying capacity?
   (*c*) Effect of grain and land prices on farm area in pasture?

4. Management of livestock on pasture:
   (*a*) Precautions necessary in "turning-out" different classes of livestock?
   (*b*) Rotating pastures?
   (*c*) Supplemental feeding on grass? Kinds of livestock? Amounts and varieties of feeds used?
   (*d*) Salt for livestock on pasture?
   (*e*) Shades? Water?
   (*f*) Kind of fence used? Most suitable kind to build at the present time?

5. Suitability of buildings for the farm's livestock:
   (*a*) Location, convenience, and sanitation?
   (*b*) Size, style, and cost?
   (*c*) Facilities for water?
   (*d*) Temporary shelters?
   (*e*) Feeding-floors?
   (*f*) Silos, corn-cribs, and granaries?
   (*g*) Lanes and drives?

6. The importance of animal health:
   (*a*) Indications of health in the farm's livestock?
   (*b*) Relation of animal health to human in the community?
   (*c*) Effect of health on profits?

7. Securing and maintenance of health:
   (*a*) Precautions taken in purchasing additions?
   (*b*) Quarantine facilities which are available?
   (*c*) Relation of feed and exercise to health?
   (*d*) Systems of sanitation which are regularly followed?
   (*e*) Use of up-to-date veterinary practices and products?

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CHAPTER XIV

MANAGING DAIRY CATTLE

Good care is fully as important to the dairy herd as good feed. High-producing dairy cows are very sensitive to their surroundings and respond quickly to either good or poor care. Even though given the best of feed, such cows do not reach their full capacity production unless they are also given the best of care, including comfortable surroundings, regularity in stable routine, and kindly treatment. Good care is particularly important during the winter months, when there are relatively few changes which can be made in the feed supply to stimulate the appetities of the animals, and when sudden changes in weather conditions may greatly alter stable temperatures or upset the regular routine. Much can be done by careful planning and management to prevent sudden drops in production and to keep the herd in good condition throughout the winter.

Management Problems:

1. Planning buildings.
2. Planning daily program of work.
3. Exercising.
4. Watering.
5. Grooming.
6. Bedding.
7. Providing for comfort in hot weather.
8. Caring for calves and other young stock.
9. Maintaining sanitary conditions.
10. Producing high-quality milk.

1. Planning Buildings.—The most important fundamentals in the planning of buildings for livestock have been considered

in Chapter XIII. There are, in addition, however, some features required in buildings to be used for housing the dairy herd, which require special emphasis.

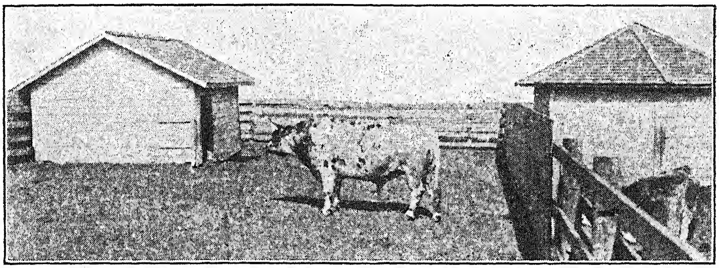
The style of barn described under Section 3 of Chapter XIII meets the needs of most dairy farms. It is best in planning the barn to take advantage of new developments in the design and construction of floors, mangers, and gutters, as well as in barn equipment and ventilation systems. This does not mean that it is necessary to have expensive construction or equipment in order to care for dairy cattle well. It does mean, however, that by employing modern designs greater convenience, assurance of strength and durability in the building, and often a lower cost of construction can be secured. Fewer expensive mistakes are likely to be made if a good plan is employed. Most agricultural colleges and the Bureau of Dairying of the United States Department of Agriculture, as well as barn-equipment companies, issue free publications which give good suggestions and plans for the building of dairy barns and milk houses.

A common mistake in building a dairy barn is to use a more expensive type of construction than is necessary. Another common mistake is to make inadequate provision for box stalls which may be used for cows at calving time, for calves, and for the herd bull. Simple two-story barns in which feed is stored in the loft are entirely satisfactory for the production of clean milk, provided there is a tight floor or ceiling over the cows. If the procedures outlined in Section 10 of this chapter are followed it is quite possible to produce clean milk in a barn of this type fitted with moderate-priced equipment.

Provision for ample warmth is necessary in dairy barns located in the northern part of the United States. In nearly all cases, the heat given off from the cattle is the only means of raising the temperature of the air in the barn above that of the outside air. In order that the temperature in the barn be satisfactory, in winter time, that is, from 45° to 60° F., it is necessary that the doors and windows fit closely and that

the walls be so constructed that frost does not accumulate on them. Walls built of solid masonry, hollow tile, or single thickness of boards are best given additional covering on the inside with dressed and matched boards, lath, and plaster, or some kind of wall-board.

Good ventilation is necessary in the dairy barn, particularly one in which an effort is being made to produce high-quality milk free from objectionable odors. Poorly built ventilators are disappointing and are not worth the time and effort expended on them. Good ventilating systems can be had from barn-equipment companies and very satisfactory ones can be



Courtesy of University of Illinois

FIG. 68.—SHELTERS AND EXERCISING YARDS FOR BULLS

These simple shelters and strongly fenced yards provide good facilities for keeping the herd sires in good health and condition. The doors of the shelters open to the south and solid fences protect from north winds.

made at home provided a good design is followed (see references at end of this chapter).

A milk room separated from the barn by a passage with swinging doors at each end, or separate from the barn entirely, is one of the necessary features on a dairy farm where milk for city distribution is being produced.

It is usually best to keep young calves in the same barn as the milking herd in order that they will be warm, unless there is a calf barn especially constructed with low ceiling, insulation, or other features to insure warmth. In large herds, artificial heat is sometimes supplied in calf barns.

2. Planning Daily Program of Work.—Cows become accustomed to regular hours of feeding and milking and seem to produce better when such a program is followed than when there is no regularity in their care. Arrange a schedule which best fits your needs and follow it as closely as possible. In planning the schedule, endeavor to have the milking hours as nearly 12 hours apart as possible if cows are milked twice daily, and 8 hours apart if milked three times daily. If cows are milked in the stable where fed, which is the most common plan, arrange that silage, hay, and any other feeds which may give an odor to milk or be dusty, be fed after milking. Consult the references at the close of the chapter for suggested programs of work.

3. Exercising.—Moderate outdoor exercise is desirable for dairy cows in winter on bright, sunshiny days, but if the weather is cold and windy care must be taken that the cows do not become chilled. Inflammation of the udder may follow such exposure. One-half hour to an hour during the day is ordinarily a sufficient length of time for cows to remain outdoors in winter time; on stormy days it is best not to turn them out at all unless this is necessary in order that they get water.

In the summer time the cows should be turned out to pasture during the day. If possible, the pasture should be near at hand, as walking a mile or more back and forth between barn and pasture is fatiguing to cows and may reduce milk yields. It is a good arrangement to have a small pasture or lot near the barn, where the cows may be turned during the night.

Regular exercise for the herd sires is one of the most important factors in keeping them in good breeding condition

4. Watering.—In spite of the fact that only a few of the experiments conducted to test the effect of warming water or the use of inside water bowls on milk production show any beneficial effects of these practices, most good dairymen favor them. When cows are turned outdoors on cold days to drink ice water, there is a tendency for them to drink too little. The use of the bowls in the stable induces them to drink more water

and also makes it possible to keep them in the stable during very cold or stormy weather. Warming the water so that it is no colder than water as it comes from a deep well is considered a profitable practice.

During hot weather it is especially important that milk cows be supplied with an abundance of good water. Provide fresh well water, if possible, and let the cows drink at least three times a day. Clean the water tanks and drinking bowls frequently. When cattle are forced to drink from stagnant pools or from streams polluted from sewage or with other discharges from laundries or factories, they are likely to drink too little and there is also a possibility of their contracting some disease.

5. Grooming.—Groom each animal over six months of age each day if time permits. Use a stiff bristle brush and currycomb and give special attention to keeping the flanks and udder clean. This practice, by helping to keep the cows clean, makes for greater cleanliness of the milk and also tends to promote a healthful condition of the hide. If done daily, it will require only one or two minutes for each animal.

6. Bedding.—In the winter time, when the cows spend most of their time in the barn, bed the stalls well with liberal amounts of clean, dry bedding. Provide enough so that the cows' udders do not come in contact with the floor. Shake up the bedding every day or two to prevent it from getting packed and lumpy.

7. Providing for Comfort in Hot Weather.—Cows suffer from exposure to hot sun and frequently such exposure is the cause of reduced milk yields. It is essential they have access to shade, particularly during the middle of the day. If there are no trees in the pasture, some provision for shade should be made, as suggested in Chapter XIII. As mentioned above, it is especially important during hot weather that cows have frequent access to an abundant supply of fresh cool water.

The annoyance of flies to dairy cows is frequently so great that it results in reduced milk yields. Young calves particularly are greatly annoyed and sometimes harmed by flies.

When these insects are extremely numerous, it is often advisable to darken the windows of the stable by tacking heavy paper, such as slaters' felt, on the inside of the sash, and keep the cows and young calves in the barn during the hottest part of the day.

Spray the cows lightly with a fly repellent before milking so that they will stand more quietly. Do not spray them heavily enough to keep all flies off during the day because this would so coat the hides that the temperature of the cows would be much higher than normal and might prove injurious.

8. Caring for Calves and Other Young Stock.—Young calves are sensitive to cold drafts and to low temperatures. They should not be kept in pens in which the bedding is damp most of the time.

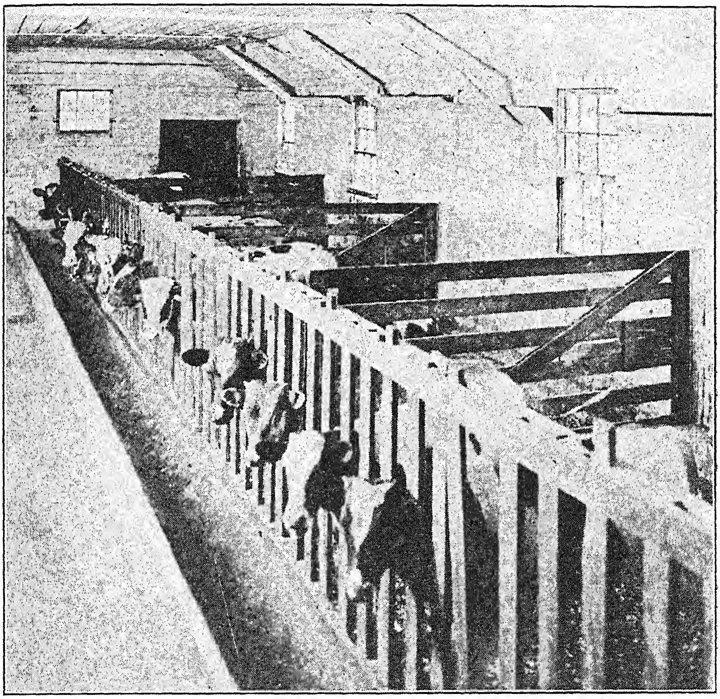
Provide an abundance of dry bedding for calves. Shredded stover, straw, peat moss, shavings, and sawdust are desirable in the order named. Often a combination of two of these, such as a layer of shavings covered over with straw, provides an excellent bed. Shavings or sawdust alone are not satisfactory for calves fed milk only. There is too great a possibility of the calves eating some of the bedding and this might cause serious digestive disturbances or even death. Supply bedding in amounts sufficient to keep the calves dry and change often enough to prevent bad odors in the barn.

Keep very young calves in individual stalls, if possible. When a number of calves are housed together in a pen, keep them in stanchions while they are being fed and for a short time afterward. The feeding of the milk should be immediately followed by the grain feeding.

Yearling heifers turned out to pasture during the summer should have frequent inspection. During the winter season it is particularly important that they shall not be neglected. While an effort should be made to feed and care for them as economically as possible, do not expect them to "rough it" through the winter in the fields or around straw piles. They must be fed enough good-quality feed to keep them growing

rapidly, as discussed in Chapter VIII. If a suitable scale is available, weigh the heifers once a month and note the gains.

Watch the heifers carefully for lice, footrot, or other ailments. Teach the heifers, and in purebred herds the young



Courtesy of University of Illinois

FIG. 69.—CONVENIENT BARN FOR YOUNG STOCK

The continuous concrete manger makes cleaning easy. The swinging gates makes it possible to use the space as box stalls for cows at calving time.

bulls also, to be led by a halter. Begin this training when the calves are four to six months of age. Groom the yearligs and accustom the heifers to being handled so that they will be gentle when they reach milking age.

9. Maintaining Health and Sanitation.—No dairy enterprise can be profitable unless the animals are healthy and vigorous. Lack of constant vigilance in exercising preventive measures may mean frequent losses of animals, lowered milk production, or even disaster should some infectious disease enter the herd.

Tests for tuberculosis are advisable in all dairy herds which furnish milk for city distribution. In most states such tests are required. Regular tests for infectious abortion are also advisable. See the references at the end of Chapter XIII for methods of procedure in conducting these tests and in handling or disposing of the reactors.

Provide a box stall for each cow at the calving period. Be sure that the stall has been cleaned carefully and then thoroughly disinfected with a 5 per cent solution of carbolic acid, creolin, or other good disinfectant. Bed deeply with dry straw or other good bedding. In herds in which infectious abortion is present, keep the cow away from the other cattle in the herd for three to seven days before calving and three to weeks afterward.

Observe closely any unusual conditions in the animals. In cases of illness in which the nature of the trouble is unknown, isolate the animal at once and keep it in isolation until cured or until it is found that the ailment is not likely to be spread to the rest of the herd.

Clean the lots frequently. Remove accumulations of manure by using a horse-drawn scraper or shovels and push brooms. A paved lot such as that shown in Fig. 70 is a great aid in the production of clean milk. Under no circumstances permit the lots to become so filthy or muddy that cows must wade through deep manure or mud to reach the barn. It is almost impossible to produce clean milk under such conditions or to disinfect the premises thoroughly once an infectious disease has entered the herd.

Brush out the mangers daily. Unless this is done, damp feed is likely to form in sticky masses and adhere to the corners. Such a condition not only reduces the appetites of the cows, but

may cause them to go off feed. When facilities permit, scrub the mangers at regular intervals, and flush out with a large amount of clean water. Keep walls and floors free from accumulations of manure and filth.

10. Producing High-quality Milk.—The thinking dairy

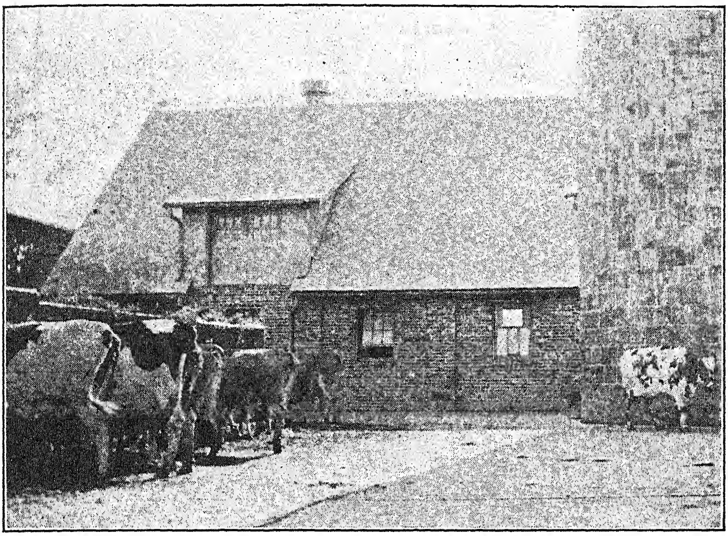


FIG. 70.—A PAVED LOT HELPS TO KEEP COWS CLEAN

It is much easier to produce high-grade milk when cows do not wade through mud to reach the barn. A paved lot also makes it possible to supply part of the roughage outdoors without loss of large quantities of feed. The lot is protected from the north and west winds by two wings of the barn.

farmer wishes to produce milk of high quality, not only because such milk usually brings a higher price than low-quality milk, but also because he wishes wholesome milk for his family use. The five essentials of high-quality milk are: safety, good food value, good flavor, cleanliness, and good keeping quality.

Procedure:

(*a*) Keep milk free from disease germs.
(*b*) Feed cows properly.
(*c*) Keep cows clean.
(*d*) Use clean methods of milking.
(*e*) Keep utensils clean.
(*f*) Cool milk quickly.

(*a*) *Keep Milk Free from Disease Germs.*—The milk consumer wishes assurance that the milk he drinks does not carry the germs of infectious diseases, such as tuberculosis, typhoid fever, septic sore throat, scarlet fever, and undulant fever. It is known that at times these diseases have been carried by milk. Pasteurization carefully done destroys disease germs in milk, but most of the milk consumed on farms and much of that used in small towns and villages is not pasteurized. It is essential, therefore, that all possible precautions be taken against the entrance of disease germs into milk.

First of all, comply with all regulations concerning the testing of the herd for tuberculosis or other infectious diseases. Be sure that the persons milking cows and handling the milk are healthy. Do not permit flies to get into the milk or to walk about in the strainer. Keep dogs and cats away from the milk. Make sure that the water used in washing milk pails and other utensils does not carry dangerous germs. If in doubt about the water supply, write the State Board of Public Health at your state capital. Never market or offer for sale milk you yourself would not drink.

(*b*) *Feed Cows Properly.*—Cows underfed for several months may produce milk below the quality called for in legal standards. The remedy, of course, is to supply liberal amounts of suitable, good-quality feeds. Feeds such as turnips, rape, and cabbage, and weeds such as wild onion, wild garlic, and ragweeds, have very pronounced effects on the flavor and odor of milk. Silage may also impart a strong flavor. To prevent these effects feed strong-smelling feeds after milking and if the cows must be pastured where wild onions and other objectionable

weeds are found, remove them from such pastures 6 to 8 hours before milking time.

While many of the odors absorbed by milk are from strong-smelling feeds which are present in the stable during milking, other odors and bad flavors in the milk are the result of milking in a poorly ventilated stable and of dirt in the milk.

(*c*) *Keep Cows Clean.*—The barn itself has little effect on the quality of the milk, so long as it provides suitable arrange-

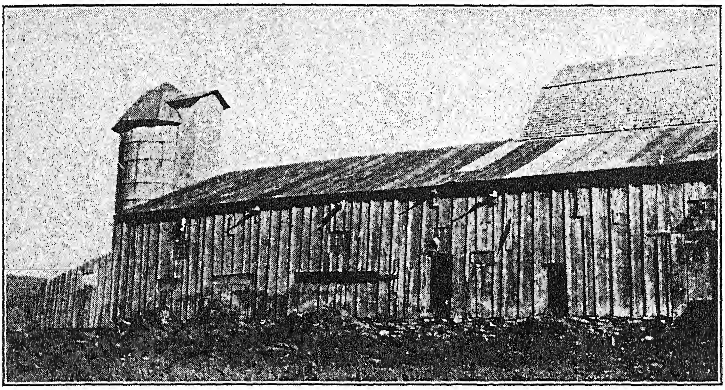


FIG. 71.—POOR CONDITIONS FOR THE PRODUCTION OF HUMAN FOOD

Would you like to drink the milk produced in this barn? Conditions could be greatly improved by adding windows, keeping the barn clean, and removing the manure daily to a greater distance.

ments whereby the cows can be kept clean. Use bedding liberally, arranging it under the cows several times a day. Groom cows regularly. Shortly before milking, clean the udders and right flanks with a wet cloth or large, soft sponge and dry with a clean towel.

(*d*) *Use Clean Methods of Milking.*—Do not milk with wet hands, as this is a filthy practice. If the teats of any of the cows are sore, milk such cows last, first placing a small amount of vaseline on the hands. Use pails with partially enclosed tops, so that the amount of dirt falling into the milk will be lessened.

Wear clean clothes during milking and milk with clean hands. Remember that the milk you are handling is a food upon which the lives of infants and health of children are dependent.

(*e*) *Keep Utensils Clean.*—Most of the bacteria in milk come from dirty cows and dirty utensils. The almost invisible film of milk and grease which remains in pails, cans, and strainers after they are washed permits millions of bacteria to develop before the next milking time, unless special care is used to prevent this growth. A stale odor in milk utensils is nearly always caused by bacteria.

Wash cans, pails, and strainers at once after use with warm water containing about 2 heaping tablespoonfuls of washing powder to a gallon of water. Scald with boiling hot water. Invert these utensils on a drying rack where they will be exposed to the sun. In the case of cans which have been washed at the factory, remove lids and invert cans on drying rack as soon as possible. Enclose the rack with screen wire netting to keep out flies, birds, and pets.

Before using the utensils at milking time, rinse them thoroughly with clean boiling water, using about 2 quarts for each can and 1 quart for each pail. If boiling water is not available, place a small amount of a chlorine compound, such as Santamine, Diversol, B. K., or similar compound manufactured for this purpose, in clean cold water and rinse the utensils with it just prior to use. If none of these compounds is available, rinse the utensils thoroughly just before using with clean, cold well water.

Strainers with fine wire-mesh bottoms are difficult to clean. The most sanitary and efficient type of strainer is one using small cotton pads which are discarded after each milking.

Give milking machines special care, as they may be the source of many bacteria in milk. Rinse the teat cups and pail at once after milking so that the milk has no chance to dry on the parts. Do this while the machine is connected with the vacuum line, drawing 2 gallons of cold or lukewarm water through each unit. Add 2 heaping tablespoonfuls of washing

powder to a gallon of hot water and draw this solution through each unit. Using brushes furnished with the machine, brush out tubes and teat cups. Wash outsides of parts and rinse all parts with clean water. Invert teat cups and tubes in a rack, fill with a chlorine disinfectant solution, and keep them filled till ready for use. At least once a week, take apart the teat cups, disconnect tubes, and brush out all parts thoroughly with stiff brush and hot washing-powder solution. Each time just before using, suck at least 2 gallons of clean cold water through each assembled unit.

(*f*) *Cool Milk Quickly.*—Begin to cool the milk as soon as possible after milking.

A good plan of cooling is to keep the milk cans in a tank filled with running water. Stir the milk in the cans with a metal stirring rod every few minutes until it has reached a temperature of 60° F. or below. If the water supply is not cold enough, it may be necessary to add ice to it. Keep the milk cold until delivery.

In summer, it is best to cover the cans with a canvas during transit from the farm. In winter, the same precautions of placing the cans in the cooling tank and covering during transit are advisable to prevent the milk from freezing.

COMMUNITY STUDIES

Visit a number of herds of dairy cattle in the community, making trips during the different seasons of the year. Draw sketches of the floor plans of the barn and write a detailed discussion of the management features noted, using the following suggestions as a guide.

1. Barn construction and arrangement:
   - (*a*) General type, one-story, two-story, etc.
   - (*b*) Expensiveness of construction.
   - (*c*) Convenience of arrangement in order to reduce labor to minimum.
   - (*d*) Ventilation system—plan of operation; effectiveness in winter in keeping air fresh and walls dry; owner's opinion of its value.
   - (*e*) Windows—possible use in ventilation; number of square feet of glass per animal; adequacy of light for milking.

(f) Size and arrangement of stalls; slope of gutters; drains in gutters; arrangement of mangers; method of cleaning mangers.

2. Winter care of herd:

(a) Is barn work done with regularity?
(b) Are cows watered in barn or turned out?
(c) Are cows allowed to exercise and for how long?
(d) Are cows groomed?
(e) How are calves and young stock cared for?
(f) Do the animals seem thrifty and well grown? Suggest improvements in the methods of care.

3. Summer care of herd:

(a) Is milk production maintained at a high level throughout the summer? If so, list the special procedures followed to insure this.
(b) If milk yields are low, suggest changes in management which in your opinion would increase yields.

4. Care of milk or cream:

(a) What grade of milk or cream is produced?
(b) If product is high grade, note the steps taken in securing it.
(c) If product is not high grade, make suggestions for improvement.

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NOTE. See also the references in Chapter XIII.

CHAPTER XV

MANAGING BEEF CATTLE

Management Problems:

1. Management of the breeding herd.
2. Caring for young animals.
3. Caring for fattening cattle.

1. Management of the Breeding Herd.—

Considerations:

(*a*) Using judgment in breeding practices.
(*b*) Caring for young calves.
(*c*) Providing necessary housing.
(*d*) Providing for exercise.
(*e*) Grooming.
(*f*) Maintaining the health of the herd.

(*a*) *Using Judgment in Breeding Practices.*—Breeding problems constitute a good percentage of the factors which make for success or failure in keeping a drove of beef cows. Here, more than at any other place in the business of beef production, is attention to details necessary if success is to be assured.

Mating.—Mating, of course, is the initial step in any animal-breeding enterprise. Lack of attention and supervision here will impose serious handicaps upon the business which no amount of later effort can effectually overcome. Failure to breed animals at the proper time, failure to use good judgment in choosing the proper method of mating, or even failure to mate at all because of the pressure of other tasks are responsible for many unproductive cows in the beef herds of the country.

The time to mate should, of course, be determined by the

time of year at which it is desired that the calves shall be born. The average gestation period of cattle is 283 days, or approximately 9½ months. Hence cows which are to calve in March should be bred around June 1.

Most farmers prefer to have their beef calves born in the spring, so that the calves may be weaned at the end of the pasture season and the cows carried through the winter on low-grade roughages which are not conducive to a heavy flow of milk. Hence the usual breeding season is in early summer, or during the months of June and July. On the other hand, farmers with dual-purpose cows usually endeavor to have their cows freshen in the early fall so that they may obtain the maximum amount of milk during the winter, when milk prices are high and when labor is available to do the milking. Therefore, for such farmers the breeding season extends from about December 1 to the middle of March.

While there are some objections to having a cow calve out of season, they are probably less serious than the financial loss occasioned by carrying her in an unproductive state for nearly a full year. Hence the wise farmer will not hesitate to breed a cow which is observed to be in heat after the close of the usual mating period, since a late calf is much better than none at all.

As a rule, beef heifers should produce their first calves at from 30 to 36 months of age. The practice of breeding yearling heifers is to be discouraged except in the case of well-developed heifers of at least average size, which may be bred at around 18 to 20 months of age rather than allowed to go over another full year. Not only does premature breeding result in the permanent stunting of the young mother and in occasional death losses of cows and calves from difficult parturition, but a high percentage of such heifers are rendered temporarily barren and are able to produce no calves the following year. Hence nothing is to be gained by too early breeding.

In general practice, two methods of mating are followed, hand mating and pasture mating. The former is the usual method followed in the case of purebred herds where more than

one sire is maintained and where great care is exercised to breed each cow to the particular bull which promises to mate with her best. Pasture mating, on the other hand, is more suited to commercial herds where the saving of labor and the certainty of getting all cows in calf are of more importance than the use of a particular sire or a knowledge of the exact date each cow was bred. However, pasture mating should not be practiced with a yearling bull, nor with a two-year-old except when the herd does not exceed twelve or fifteen cows.

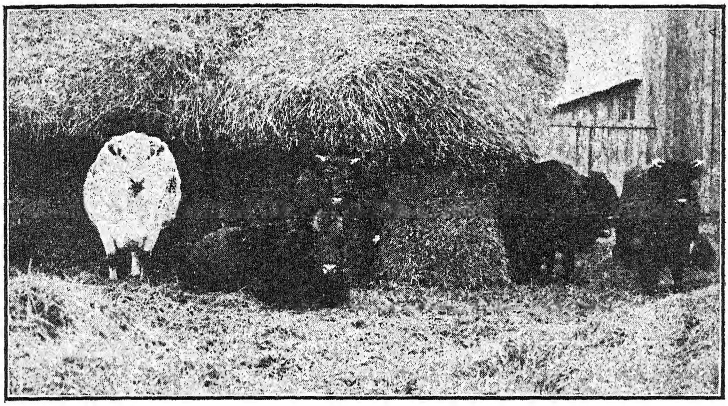


FIG. 72.—BREEDING MATRONS IN EASE AND COMFORT

Pregnant cows should be segregated from other stock and provided with dry, comfortable quarters where they may lie and rest.

Caring for Cows during Pregnancy and Parturition.—If possible, pregnant cows should be kept separate from the rest of the herd. Especially should they not be harassed by young horses and mules, which often seem to take special delight in dashing in among the cattle, scattering them in all directions.

Pregnant cows, if undisturbed, usually move about slowly, apparently saving themselves from as much exertion as possible. Consequently, in the winter time they sometimes must be encouraged to take exercise by driving them to a distant

stalk field or by giving them their morning feed in the form of a load of fodder or hay scattered over a snow-covered pasture.

Pregnant cows should be protected against sudden shock. Hence all operations such as dehorning and branding should be postponed until after calving. For the same reason, very cold water should not be given to a pregnant cow which is warm and thirsty.

As a rule, a cow will reveal that the end of her gestation is but a few days distant by a sudden filling of the udder and by a noticeable relaxation of the muscles of the pelvic region. Also, as parturition approaches, she becomes more or less nervous and finally withdraws to a distant part of the lot or pasture to give birth to her calf.

In case of a clean herd known to be free from any breeding diseases, calves had best be born out of doors in a grass lot except, of course, in bad weather, when a roomy, well-bedded box stall should be provided. Should the cow after a reasonable time spent in labor fail to deliver her calf, a veterinarian or experienced herdsman should be summoned as quickly as possible.

Following birth, the cow and calf should be left alone for four or five hours, by the end of which time the calf will usually have got to its feet and nursed. If it has not done so, it should be assisted in standing and nursing.

Caring for Newly-born Calves.—During warm, favorable weather young calves may run with their mothers on pasture. Winter-born calves, on the other hand, will be safer and more comfortable if they are kept in separate well-bedded quarters and turned to their mothers only at morning and evening to nurse. If sufficient box stalls are available to allot one to each cow, the calves may remain with their mothers throughout the night. During the day the calves may run together in a sheltered lot if the weather is fair; otherwise they should be allowed to run loose in two or more adjoining stalls where they can get as much exercise as possible.

Young calves will begin to eat when about three weeks old.

A suitable grain ration should be provided at this age if they are to be marketed when from nine to fourteen months old as baby beeves. If, however, they are to be fed six or more months after weaning, there usually is no advantage to be gained by feeding grain during the nursing period.[1]

Watching Factors Determining Size of Calf Crop.—By the "calf crop" is meant the ratio of calves raised to the number of cows bred. Seldom does every cow in the herd produce a living calf, which means that the calf crop usually is below 100 per cent. As a rule, a larger calf crop is realized with herds of twenty to thirty cows than with herds of much larger numbers. This fact is due principally to the larger amount of individual attention which the animals of smaller herds usually receive.

Among the more important factors that determine the size of the calf crop may be listed the following:

(1) Small percentage of pregnancies, due to:

- (*a*) Failure to detect cows in heat.
- (*b*) Unthrifty or diseased condition of cows.
- (*c*) Impaired breeding qualities of bull.
- (*d*) Too large a number of cows per bull.

(2) Abortions. Where more than 4 or 5 per cent of the cows abort, the abortion probably is of the contagious form.[2]

(3) Loss of calves during or soon after birth. Difficult parturition, exposure, scours, and congenital weakness are the principal causes of loss at this period.

(4) Loss of calves over one month old but under weaning age. Bloat, hemorrhagic septicemia, blackleg, and accidental injuries are responsible for occasional deaths at this age. However, if good feeding and management are practiced and the calves properly protected

[1] Cf. page 169.
[2] Cf. page 50.

against harmful infections by the use of the proper immunizing agents,[3] losses during this period can be practically eliminated.

Inasmuch as the cost of maintaining the whole herd must be charged against the calves raised, it is important that there be as few unproductive cows as possible. While a 100-per-cent calf crop is perhaps too much to expect even of the best-managed herds, it should be the goal strived for. Anything less than 80 per cent should be regarded as unsatisfactory, particularly in the corn belt, where because of the smaller size of the herds and better shelter facilities, losses can be prevented more easily than on the western range.

(*b*) *Caring for Young Calves.*—In the management of young calves there are a number of necessary operations.

Castration.—Bull calves intended for the feed lot should be castrated before attaining three months of age; otherwise they are likely to become too coarse and "staggy" about the head and neck to make good steers. As a rule, castration is best done when calves are from four to ten weeks old, since at this age they suffer less loss of blood than do older calves.

Two methods of castration are in use among cattlemen, either of which is satisfactory if properly performed. The older and more common method involves the cutting open of the scrotum with a sharp knife and removing the testicles with 3 or 4 inches of the spermatic cords. The other method, which is coming into wide use, especially in the range states, consists in pinching the scrotum above the testicles with special castration pincers which crush or sever the spermatic cord, together with the associated blood vessels, so completely that the testicle will gradually waste away and be absorbed for want of blood supply. Since this method results in no open wound or loss of blood it may be used with safety in warm weather, when the prevalence of flies and maggots makes the use of the knife highly dangerous.

[3] Cf. U.S.D.A. "Diseases of Cattle."

While castration is in no sense a difficult or complicated operation, it should not be attempted by the novice until he has been thoroughly instructed in the task by a competent experienced herdsman or by a veterinarian. A bungled job with either the knife or pincers will at least result in an ugly wound requiring much treatment and attention and may even result in the death of the animal through loss of blood or infection.

Dehorning.—While a nicely shaped pair of horns is considered an essential qualification for a purebred animal of the horned breeds, horns on commercial cattle are highly objectionable. Following are the principal disadvantages of horned cattle as compared with dehorned:

(1) They do not present as neat and uniform an appearance as dehorned animals.
(2) They require more shed and feed-trough space.
(3) They are more inclined to fight and injure one another.
(4) They are more dangerous to handle. This applies particularly to herd bulls and to cows with young calves.
(5) They are discounted from 50 cents to $1.00 per hundredweight by market buyers because of the numerous bruises caused by horns during shipment.

Because of the many objections against horns and their few if any advantages,[4] the practice is to dehorn all horned cattle except purebred animals which are to be kept for breeding purposes. Theoretically the ideal way to be rid of horns is to use only polled bulls which are known to breed pure in respect to the polled character. However, the number of polled bulls is quite insufficient for general use throughout the country. Also, in the case of the two most widely distributed breeds of beef cattle, viz., Shorthorns and Herefords, the polled strains are

[4] Horns are still considered of some value in certain sections of the West in enabling cows better to guard their young calves against beasts of prey. Also, it is claimed that range bulls, if dehorned, will run together instead of dispersing themselves throughout the herd.

regarded as somewhat inferior in type to the horned varieties; consequently breeders are loath to discard their horned cattle for animals believed to be less desirable in all-round general excellence.

In the case of calves under two or three weeks of age the growth of horns may be permanently arrested by rubbing the the embryo horns, or "buttons," with a strong chemical which will destroy the matrix from which the horn grows. The agent most commonly used is caustic potash (KOH), which may be purchased from any druggist in stick form resembling ordinary blackboard chalk. Care should be taken in applying caustic to rub only the skin over and immediately adjacent to the budding horn; otherwise a severe burn and sore may result. Also, caustic should be handled only with gloves or heavy paper to prevent its burning the hands of the operator.

In the range states caustic is seldom used in dehorning calves for the reason that the calves are usually born in open country where they are hard to catch and treat at the proper age. Range calves are usually dehorned with a special clipper or "gouger" when from one to three months of age, at which time they are also castrated and branded.

Calves of weanling age and older cattle are usually dehorned with dehorning clippers which cut off the horn about ¼ to ½ inch below the hair line, so as to remove the matrix from which the horn grows. In order to make the cut at the proper place and to prevent injury to the operators some special form of restraint-equipment, such as a dehorning chute or pinch gate, should be used, especially where more than a few head of quiet, well-broken animals are to be dehorned.

As a rule, the bleeding which follows dehorning is not excessive and will soon stop of its own accord. However, if an animal is observed to be still bleeding profusely one hour or more after the operation, coagulation should be hastened by dusting a little Monsel's powder into the wound. Dehorning should be avoided during very cold or inclement weather; also during the season of the year when flies are prevalent, as serious

complications will arise if the horn sinuses become infested with the screw worm maggot of the common blow fly.

Weaning.—Beef calves usually are weaned at from six to eight months of age, simply by removing them from the herd and confining them in a small lot near the barn, where they may be taught to eat grain. As a rule, the date of weaning is determined by necessary changes in the management of the herd, such as the removal of the cows from pasture to stalk fields or to some outlying pasture where the calves could not be fed conveniently. Cows which are not almost dry should be partly milked out every other day to prevent the development of udder trouble.

(*c*) *Providing Necessary Housing.*—No expensive or elaborate shelter is required by the breeding herd. Indeed, many herds run out of doors the year round with only such protection as is afforded by straw stacks, brush-covered hills, or heavy timber. Such shelter is often very satisfactory for cows which will not calve until late spring, especially if they are given considerable range which offers protection against a variety of weather conditions. However, in most cases it will be necessary to make some use of artificial shelter such as a deep shed open on the south side which will afford a dry, sheltered place for the cattle to lie and yet admit sufficient air and sunshine to keep the animals healthy and thrifty. In those sections of the country where considerable "sloppy" weather prevails during the late winter months a small paved lot adjoining the shed is highly desirable.

Cows which calve during the winter should be stabled in roomy, well-bedded box stalls a few days before parturition and not returned to the herd until their calves are a week or ten days old. If the size of the shed permits, one end may be partitioned off and the young calves allowed to go in and out as they please. Otherwise the young calves should be kept apart from the cows and turned with them only to nurse.

Summer shelter against the sun is usually provided by trees.

If no trees be present an artificial sun shade should be constructed similar to the one shown in Fig. 65.

(*d*) *Providing for Exercise.*—As a rule, the exercise which cattle get while foraging for their feed is sufficient to keep them in good health and vigor. However, exceptions may occur in the case of cows which are confined in rather close winter quarters and herd bulls which are permitted the run of only a small lot or yard. Cows so wintered should be induced to

Fig. 73.—A Bite to Eat in the Fresh, Open Air

Stalk fields furnish both feed and exercise to the breeding herd on bright winter days.

exercise on bright winter days by turning them into stalk fields or by occasionally giving them their morning feed in the form of stover spread thinly over a frozen pasture. Herd bulls which are inclined to be lazy and sluggish should be led from a half-mile to a mile daily to keep them in good breeding condition. Quiet bulls may be afforded exercise by letting them run with a small drove of pregnant cows each day.

(*e*) *Grooming.*—As a rule, little time is spent in grooming beef cattle. Exceptions, of course, occur in the case of purebred cattle which are being fitted for sale or show. While

regular grooming, such as is given horses, is perhaps neither practical nor necessary, an occasional brushing of breeding cattle is very desirable both to maintain a thrifty condition of the skin and hair and to gentle the animal and make her more easily handled. Vigorous brushing not only cleans the skin by removing dust, dandruff, and dead hairs, but it also favors the nutrition of the skin through promoting a more vigorous circulation. Cattle which are brushed once or twice a week during the winter seldom are troubled with lice.

(*f*) *Maintaining the Health of the Herd.*—Although beef cattle appear to be more resistant to disease and to harmful parasites than most of the other classes of farm animals, it is highly important that those maladies to which cattle are susceptible be kept from the herd. This can best be accomplished by the adoption of strict sanitary measures in the management of the herd, coupled with systematic testing for those diseases which may be detected in their early stages before they have brought about a change in the appearance or behavior of the animal. Tuberculosis and contagious abortion are diseases of this kind and they can be quietly and effectively eradicated by the regular testing of all animals in the herd and disposing of those which react.

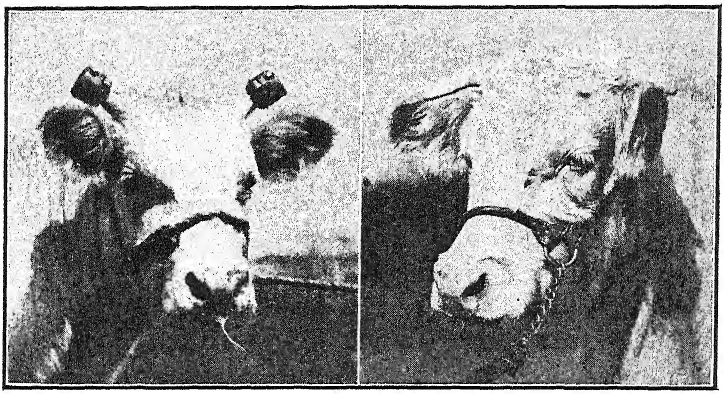
Minor ailments such as scours, bloat, indigestion, and founder can be greatly reduced if not totally eliminated by exercising care in the kind and amount of feed supplied. Particularly should moldy, dirty, or otherwise damaged feeds be avoided as well as too sudden changes in the character or amount of feed given. Barns and feed lots should be kept in as sanitary condition as is practical by the frequent removal of manure and by thoroughly disinfecting and liming any portion of the premises suspected of being contaminated.

2. Caring for Young Animals.—In the main, young animals should be given the same care and management as are accorded the breeding herd. However, their tender age and undeveloped bodies warrant a special consideration of this topic.

In purebred herds, where only the plain and mediocre bull

calves are castrated, care must be taken to segregate the bull calves at about five months of age. When so handled they feed better and are less restive; consequently they tend to keep in better condition than they would if allowed to remain with the herd. Steer and heifer calves may run together until one or both lots are sold or consigned to the feed lot.

Where facilities permit, it is highly desirable to separate weanling calves from yearling cattle, and yearlings in turn from mature animals. Such separation not only permits a more



Courtesy of University of Illinois

FIG. 74.—"BEFORE AND AFTER USING"

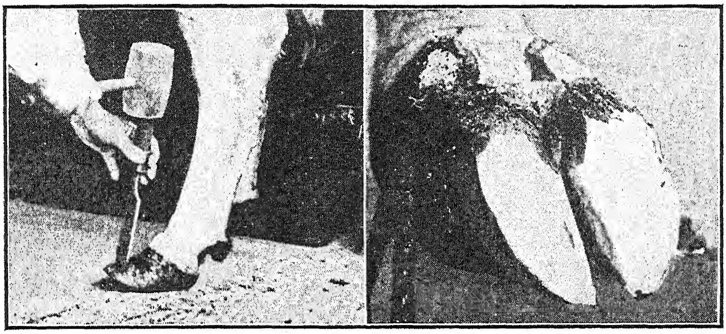
Showing how weights, when properly used, are of much assistance in promoting the desired shape of horn.

intelligent and economical plan of feeding, but it insures to each animal its proper share of feed, shelter, and rest. Segregation on the basis of size and age is much more important in the more or less crowded and cramped quarters of winter than in summer when the cattle are running in open pasture. However, heifers under breeding age should in no case be allowed to run in the same pasture as is used by the herd bull.

Care of Horns.—Young purebred cattle of the horned breeds that are to be kept for breeding frequently must have their

horn weighted to induce them to grow after the approved pattern. Such weights, as a rule, are most effective if applied when the horns are about 3 inches long. The size of the weights should be in proportion to the size and length of the horns. Short, stubby horns require heavier weights than do those of average length. Rasping the horn on the outer border of the desired curve is of some help in making it take the proper direction.

Care of Feet.—Attention should be paid to the feet of growing animals to prevent their wearing off unevenly. Especially are



Courtesy of Professor H. P. Rusk

FIG. 75.—METHODS OF FOOT TRIMMING

(*a*) The wrong way, which merely shortens the toes.
(*b*) the correct way, which levels the soles and restores the pastern to its proper shape.

long, overgrown toes objectionable, since they throw the weight of the body far back on the heel, resulting in great strain on the tendons of the pastern and lower leg. Misshapen feet should be leveled up by restoring a flat bearing surface through paring and rasping off the overgrown portions of the hoof. Since these portions can be removed effectively only from the underside of the foot, the animal must be either confined in stocks or thrown to permit a satisfactory job if the feet are in bad condition.

3. Caring for Fattening Cattle.—

Considerations:

(*a*) Unloading and subsequent management of feeder cattle.
(*b*) Turning cattle on grass.
(*c*) Providing shelter and equipment for fattening cattle.
(*d*) Preparing cattle for shipment and sale.

(*a*) *Unloading and Subsequent Management of Feeder Cattle.*—Cattle which are bought on the large central markets or directly from the range arrive at the farm tired and worn out as the result of their long journey. They should, therefore, be given an opportunity to rest for a few days before starting them on feed.

Railroads are required to unload, feed, water, and rest all livestock so as to prevent their being confined in cars in excess of twenty-eight hours, but frequently such unloading is done where facilities for feeding and watering are not satisfactory. Hence cattle often arrive at the farm very hungry and thirsty, and caution must be exercised in feeding and watering to prevent possible injury from overeating and drinking and from crowding about inadequate feed bunks and watering tanks.

Cattle should not be either fed or watered while they are tired or warm. Instead they should be allowed to rest undisturbed for an hour or two and then turned a few head at a time into a lot where plenty of water is available. Watch should be made to prevent any unusually thirsty animal from gorging itself with water. After each drove has had a reasonable time for drinking, it is driven on to another lot where feed in the form of mixed or prairie hay or some other form of dry carbonaceous roughage is available. If the weather permits this hay can best be fed on the ground of a good-sized lot; otherwise it should be fed in racks or bunks placed in the open. Inside feeding is to be avoided, as some of the more timid animals will not venture inside until they become acquainted with their new surroundings. After the last drove of cattle has started eating

hay, the gate leading to the water tank may be opened to permit any animal which is still thirsty to return and drink.

Even though the cattle are to run for a time on pasture before being consigned to the feed lot, it is advisable to hold them in dry lot until it is reasonably certain that no cases of "shipping fever" [5] are to develop. Four or five days should suffice for such observation, after which time they may be turned on pasture or started on feed according to the plan of feeding to be followed.

(*b*) *Turning Cattle on Grass.*—In turning fed cattle from the dry lot onto pasture certain precautions must be observed if their gains are to continue without serious interruption. The change from dry roughage to fresh, green forage may so affect the appetite and nutritional intake of the animals that a loss of weight amounting to as much as 30 or 40 pounds per head may occur during the first two weeks of the grazing season.

In the first place the principle may be laid down that grain-fed cattle sufficiently fleshy to be termed "half-fat" or better should seldom be turned onto pasture. Rather, they should be continued in the dry lot until they are ready for market. On the other hand, cattle in thin or moderate condition which have been wintered largely on roughage may be turned onto pasture in the spring with full assurance that they will utilize the grass to good advantage. While such cattle may show a slight loss of weight if weighed at the end of the first week or ten days, it will soon be regained. However, grain-fed steers which are turned onto grass may weigh no more at the end of the first month than when they left the dry lot. This results from the fact that the green, "washy" grass falls far short of supplying as much energy as was contained in the dry roughage and extra grain consumed by the cattle before they had access to pasture.

Cattle should be turned onto green legume forage only after they have eaten a generous quantity of other feed; otherwise the large amount of nitrogenous material taken into the paunch

[5] Cf. U.S.D.A. Leaflet No. 38.

will have a strong tendency to produce bloat. Bloat is particularly likely to occur if the cattle are turned onto clover or alfalfa pasture for the first time when the forage is wet from dew or rain. The danger of bloat is somewhat lessened by keeping a supply of mixed hay or oat straw in the pasture where it is easily accessible to the cattle.

(c) *Providing Shelter and Equipment for Fattening Cattle.*—Cattle which are fed during the winter months should be pro-

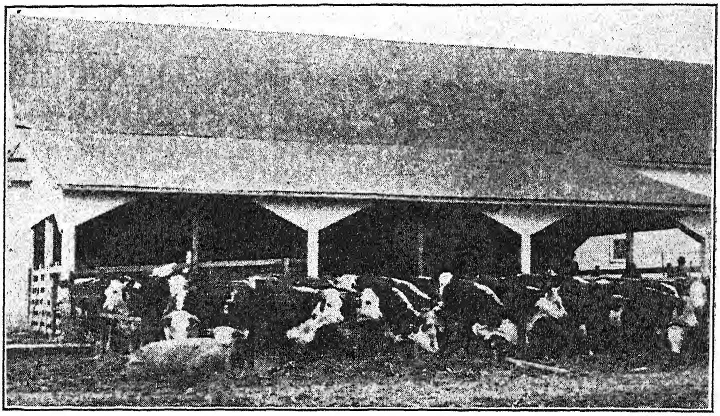


Fig. 76.—A Good Type of Cattle Barn

The open shed and small paved lot afford comfort to the cattle in all kinds of weather. Also, practically all of the manure is saved for return to the land.

vided with sufficiently good shelter to protect them against cold winds and insure a dry bed on which they may lie down and rest. For this purpose a deep shed open on the south is perhaps most satisfactory. Thirty to 40 square feet of space should be allowed per head, depending upon the size and age of the animal. A shed 60 feet long and 24 feet deep will provide adequate space for a carload of cattle, especially if the troughs and mangers are on the outside walls so as to leave as much clear floor space as possible.

A small paved lot adjoining the shed is of great value in bad weather when dirt lots become almost impassable for man and beast. Not only does pavement keep the cattle more comfortable and make the task of feeding less arduous, but it greatly increases the returns realized from the pork and manure credits.

Shade and protection from flies assume the same importance in summer feeding that sheds and pavements occupy in the case of winter-fed cattle. Where summer feeding is done in dry lot, the barn should be darkened by nailing burlap over the windows and hanging curtains before the doors to lessen the annoyance caused by flies. Little can be done to protect pasture-fed cattle from flies. However, strips of burlap hung from the branches of trees or from the joists of artificial sun shades at such a height as will brush the backs of the cattle will afford some relief.

(*d*) *Preparing Cattle for Shipment and Sale.*—The loss of weight suffered by cattle between the feed lot and the market is termed "drift," or "shrink." Shrinkage is usually expressed in terms of a percentage of the original or feed-lot weight. The amount of shrinkage suffered depends upon a number of factors, the most important of which are: (1) the character of the ration fed, (2) the condition of the cattle at the time of loading, (3) the length of the journey, (4) the degree of comfort experienced en route, and (5) the "fill" made by the cattle after arriving at the market.

As a rule, cattle which have been fattened on feeds of a laxative nature will shrink more than cattle which have been getting little or none of such feeds. Hence it is a good plan to reduce the protein concentrate fed during the two or three days immediately preceding shipment and to replace legume hays with carbonaceous roughages. Grass-fed cattle should, if possible, be fed in the dry lot for the last week or ten days of the feeding period.

Cattle will stand shipment better if they are not too full of feed and water at the time of loading. Hence it is recommended that the last feed of grain be restricted to one-half the

usual amount and that water tanks be covered four or five hours before the drive from the feed lot. However, if the weather is warm a small allowance of water may be given at the station immediately before the cattle are loaded. As a rule, nothing is to be gained by handling cattle in such a way as to induce them to take on an unusually large "fill" at the market, as buyers are quick to detect such cattle and frequently refuse to bid on them until the market session is nearly over.

FARM AND COMMUNITY STUDIES

1. At what season of the year are most beef calves born on the farms represented by the students of the class? What factors seem to make such season desirable?

2. At what age do the beef heifers on your farm usually produce their first calves? How do the size and weight of heifers calving at this age compare with the size and weight of heifers calving earlier and later, respectively?

3. Make daily observations of cows on your farm which are nearing the end of gestation to note the changes which occur during the two or three weeks previous to parturition.

4. Ascertain for your own or a nearby farm for the past 12 months (*a*) number of cows bred; (*b*) number of cows calving; (*c*) number of calves born alive and strong; (*d*) number of calves weaned. Calculate the calf crop for the farm represented by each student and for the entire group of farms as a whole. What steps would you advise to increase the calf crop on the farms of your community?

5. Visit a farm where cattle are being dehorned and observe the methods of restraint and dehorning employed.

6. Dehorn a young calf with caustic potash, observing the precautions mentioned in this chapter.

7. Visit three or four farms and study the kind and arrangement of barns and equipment used in the housing, feeding, and management of (*a*) breeding cows; (*b*) young calves; (*c*) fattening steers.

8. Visit the farm of a purebred Shorthorn or Hereford breeder and note the means employed in training the horns of the young animals.

9. Visit a farm on which feeder cattle have just arrived and note the method used in resting the cattle and starting them on feed.

10. Visit a farm from which fed cattle are soon to be shipped and ascertain from the owner the preparation usually made to reduce shrinkage in transit.

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NOTE. See also the references in Chapter XIII.

CHAPTER XVI

MANAGING HORSES

SKILL and attention to details are particularly important in breeding and using horses. It requires about four years' time after breeding a mare to get a colt which is capable of fairly hard, steady work on the farm. Since reproduction is slow, the penalty for lack of attention and skill in mating and in handling the brood-mare and her foal is frequently very high. Likewise in handling the horse at work the penalty for negligence or slackness may be most serious. For example, by overworking horses during extremely hot weather, many years of usefulness may be needlessly sacrificed. Carelessness in handling young horses may cause their developing habits which partially or even altogether spoil their reliability as workers.

Management Problems:

1. Caring for the brood-mare.
2. Caring for the foal.
3. Training for work.
4. Giving stable care.
5. Providing proper harness.

1. Caring for the Brood-Mare.

Considerations:

(*a*) Breeding data.
(*b*) Time of year for foaling.

(*a*) *Breeding Data.*—Mares are not ordinarily bred until they are three years of age. Occasionally the well-grown two-year-old draft filly is bred to produce a foal at three. This

practice increases somewhat the hazard at foaling time. The average period of gestation in the mare is 340 days. The length of the period varies considerably. In normal, healthy mares it is usually twenty-one days from the beginning of one heat period until the beginning of the next. Mares, in warm weather, remain in heat from five to seven days. They are usually covered by the stallion when in good strong heat; this is at the middle or toward the latter part of the period. On well-managed breeding farms mares are carefully tried every other day after the elapse of two weeks after breeding. This is kept up until the thirtieth day has passed; after that they are tried twice per week until the end of the breeding season. Such precaution is not usually possible with farm mares. They should, however, be carefully returned for trial on the eighteenth and twenty-first days after breeding. Occasionally, mares settled in foal are rebred; this is likely to cause the loss of the fetus.

The healthy mare which has successfully foaled should be bred at the first heat after foaling. This is usually about the ninth day; most mares "come in" between the seventh and eleventh days after foaling. If any infection is present, breeding should be postponed until the condition of the mare's reproductive organs is pronounced healthy by a competent veterinarian. Great harm has resulted from breeding mares which are not in good breeding health. In horse-breeding communities probably not over 60 per cent of the mares which are bred conceive. Where special precautions are taken, this percentage may be increased by from 15 to 25 per cent.

(*b*) *Time of Year for Foaling.*—The normal foaling time is in the spring. Mares usually conceive most readily after grass has come and they have shed their winter coats. May is usually a good month in which to have the farm mare foal. With late-winter and early-spring foals, warmer stabling is required and more attention, and the casualties of both foals and mares are higher. Some breeders prefer to take the increased chance because of the extra growth which very early foals may make. A few farmers favor having the mares foal

in the fall since that is a slack season for farm work and hence the foals interfere very little with the use of the mares. Breeding for a fall foal the mare which has not settled to spring service may save several months' time. Mares foaling in the fall should be bred so that they will not foal when the fly season is at its worst. October is a good month for fall foaling. Mares are less likely to come in season regularly in the fall.

Procedure:

(*a*) Try the mare before breeding.
(*b*) Prepare for foaling.
(*c*) Watch for signs of approaching foaling.
(*d*) Watch brood-mare carefully during and after foaling.

(*a*) *Try the Mare before Breeding.*—Before mares are bred it is necessary to try, or tease, them with the stallion which is to breed them or with some other stallion which is kept as a teaser. The mare, when she is being teased, should be separated from the stallion by a strong pole or partition. She should be bridled and held by a careful man. It is seldom if ever advisable to breed mares which do not show unmistakable evidence of being in season.

For serving by the stallion, the mare should have the nose-twitch applied and be hobbled. Most breeders use hock hobbles because they are safer for the stallion. The best available footing should be selected and every effort made to prevent accidents. Stallions are more easily handled about the farm when all covering of mares is done in one particular place.

(*b*) *Prepare for Foaling.*—Many mares whose foals come when the weather is warm and the grass is well started, foal on pasture. Pasture used for this purpose should be clean and not be foul with droppings. Pastures containing open ditches or holes, or which are very irregularly surfaced, are not suitable. It is convenient to have this pasture located close enough to the farm buildings so that mares may be frequently inspected.

Inside foaling should be practiced in the case of those mares

which foal early and in all cases where it is desired to take special precautions. The mares are turned out in daytime, except when the weather is unusually stormy, and kept up at night. Box stalls used for foaling should be roomy—16 feet square makes a suitable size—and should be free from low mangers and other obstructions. Before each use they should be thoroughly cleaned as directed in Chapter XIII. Use plenty of clean dry straw for bedding. Strict cleanliness at foaling time considerably reduces the hazard which is associated with the operation. Accustom the mare to the stall several days before she foals.

(c) *Watch for Signs of Approaching Foaling.*—Increased distention of the abdomen, more or less stocking of the legs, swelling of the udder, and relaxation of the pelvic ligaments are some of the more noticeable signs of the approach of this important event. Wax appears on the ends of the teats at from two to four days previous to foaling.

(d) *Watch the Brood-Mare Carefully during and after Foaling.*—On farms where valuable horses are raised it is almost always the custom to watch the brood-mare carefully a few days previous to and during foaling and also for a few days afterward. This is a job for a conscientious, alert, and careful man. With healthy, well-exercised mares foaling is usually a short job. The first indications of immediate foaling are restlessness or uneasiness on the part of the mare. Then follows the bursting of the water bag. Shortly after labor begins, the front feet of the foal should appear, followed by the nose. Normally the back is up with the head between the forelegs. If the mare has matters well in hand she should not be helped. In the event of difficult, delayed birth or false presentation, no time should be lost in summoning expert veterinary help.

The afterbirth usually comes away within two hours after foaling. If it does not come away within twelve hours, or sooner in hot weather, it should be manually removed. Extreme cleanliness is necessary on the part of the operator. Dirty hands and finger nails are dangerous. It is a wise precaution

to watch all newly foaled mares closely for several days. Any marked rise in body temperature indicates disease. Any marked or offensive discharge should receive veterinary attention. It is important to catch any variance from normal health without delay.

2. Caring for the Foal.—

Considerations:

(*a*) Helping the new-born foal to get a good start.
(*b*) " Turning out " the mare and foal.
(*c*) Weaning.

(*a*) *Helping the New-born Foal to Get a Good Start.*—The navel cord will usually break a short distance from the foal's belly when the mare arises after foaling. Do not ligate the cord unless the hemorrhage is profuse. In case the cord does not break, it should be ligated about 2 inches from the body and severed with dull shears. Both string and shears should be in a disinfectant before being used. Tincture of iodine should be carefully and thoroughly applied to the stump of the navel. It is wise to use the iodine occasionally until the navel stump dries up and drops off.

In cold weather it is important to rub the foal vigorously with towels or bran sacks until it is dry. It should be on its feet and nursing within an hour or so. See that its bowels move. Castor oil or a soap-suds enema are the favorite remedies for constipated foals. In case of diarrhea, give the foal a dose of castor oil and cut down on the dam's feed. Observe the mare's udder; it may be badly caked at foaling time. This condition usually disappears within a few days, provided the mare is lightly fed and carefully exercised.

(*b*) *" Turning out " the Mare and Foal.*—Mares and young foals should ordinarily not be turned out into the larger groups of mares until the foal is ten days or two weeks of age. Extreme caution should always be observed in putting strange mares into groups. Young foals should not be permitted to lie about on cold, damp ground.

(*c*) *Weaning.*—Five or six months is the usual age at which foals are weaned—the earlier age for foals of hard-worked dams and the latter for foals of mares which do not work. Foals should be confined where they cannot damage themselves by running or by jumping fences. For the first few days they may be safely turned in pairs in a box stall. Weaned foals should run by themselves; they will have a better chance to get sufficient feed and are not so likely to be injured as when in the general herd.

3. Training for Work.—

Considerations:

(*a*) Gentling the foal.
(*b*) Breaking the rising three-year-old colt to harness.
(*c*) Using big team hitches.
(*d*) Using judgment in handling horses.

(*a*) *Gentling the Foal.*—The main idea to keep in mind in handling foals is to do only those things which will result in a good, useful finished product. Kindness, patience, and firmness are all required on the part of the handler. The horse has an excellent memory; he is a creature of habit and learns largely through the association of ideas. Foals should never be played or "fooled with." It is decidedly more satisfactory to pursue a course in training which will result in only good habits being formed than it is to spoil the colt and then spend time in attempting to break his bad habits.

It is desirable to handle the very young foal. Probably his first lesson will consist in his being held while his navel is being treated. Later on, as time permits, he should be stroked and brushed. When two or three months old or in any event before weaning, fit the foal with a strong, comfortable halter; teach him to lead and stand tied. Tie him up for short periods beside his mother in a double or box stall. The feet of the foal should be handled at an early age; he should be taught to stand quietly on three legs while the remaining one is being handled. The head horse-wrangler on a large western ranch

once informed the author that they had very little trouble at breaking time with colts which were thoroughly gentled as foals before weaning.

(b) *Breaking the Rising Three-year-old Colt to Harness.*—A few farmers put their draft-bred colts to light work during the spring that they are two years old. Well-grown colts can safely do considerable light work at this early age. It is a good plan to work them not more than half days. Usually the most satisfactory practice in handling farm colts is to have them in shape to go into harness at three years of age. They are then strong enough to do a day's work and they are young enough so that ordinarily they are easily handled.

Most farm-raised, rising three-year-old colts have already been haltered, tied up, and led. The safest way to tie the "green" colt is by running the halter rope through the ring or hole in the manger and tying the rope by means of a couple of half-hitches just below the knee or around the fetlock. A rope thus secured to the leg is also a valuable help in teaching the colt to lead. A loop of rope around the body in front of the hips will bring the colt forward when pulled on; however, it makes difficult the job of teaching him to back when put in harness. Tying a halter-puller with a rope under his tail will usually prevent halter-pulling. It is likely, however, to make a confirmed kicker.

Put the harness on the colt and let him stand for short periods in his stall until he has become thoroughly accustomed to its feel. In a similar manner, get him accustomed to the bridle, which is put on over his halter; take care at the start to see that the bit is adjusted rather high in his mouth. This will tend to prevent the colt's forming the disagreeable habit of getting his tongue over the bit.

The next step is to "ground-break" the colt thoroughly in a small well-fenced lot. Use a pair of 20-foot cotton-cord rope lines. Keep the inside line free and run the outside one through a ring fastened on the girth billet. With this precaution almost any colt can be safely handled in a small enclosure

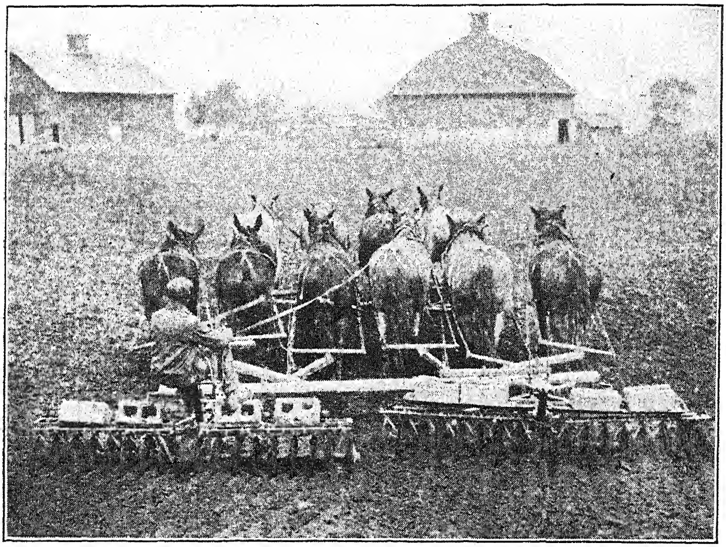
by the trainer on foot. Using two lines is much safer than working the colt in circles on a single line. Drive the colt at the walk, trot, and gallop in circles to the right and left, remembering to run the outside line through the ring. Drive the colt in straight lines, stop him, turn him, and teach him to back. Plenty of work on the circle at the different gaits will take all ideas of running away out of his head. Work with the long lines will make him clever at turning. Before he is hitched to anything, he should know the meaning of and implicitly obey the terms "whoa," "back," and "steady." Above all, teach him that "whoa" means to stop then and there. The driver's voice may do much to make the colt quiet and tractable.

In the case of the farm colt the next step will logically be to drive him double to a farm wagon hitched with a well-broken old horse with which he is already on friendly terms. The rear wagon wheels should be locked with a brake or tied. A level field is a good place for the first lesson or two. At first, work the colt on the outside; later he should be accustomed to both sides of the tongue. Tie him with a strong halter and rope to a ring securely fastened to the tongue. For the first few times use a guy-line; this should be held in the hands of a careful assistant. For teaching the colt to pull, a stone boat, which may be easily loaded and unloaded, is preferable to a wagon.

Ground-breaking, previous to hitching to a vehicle, may take a little more time and may not prove nearly so exciting as just to harness the "green" colt, tie him to his team mate, hitch him to a wagon, and start out. It is, however, a very worthwhile practice; its value may be judged by the fact that it is used and is highly regarded by many of the most successful trainers of all classes of horses. It should be added that all horses should be taught to carry a man on their backs; one never knows when this will be a convenience. Harry D. Linn in "Horse Breaking" gives very valuable advice with respect to methods and devices for the handling of wild, unruly, and

spoiled colts and horses. This pamphlet is well worth careful study.

(*c*) *Using Big Team Hitches.*—Practices with respect to working farm horses are changing. There is distinct economy in working more horses per man, in driving big teams safely, with one set of lines, in tandem hitches which practically



Courtesy of University of Illinois

FIG. 77.—DISKING LAND FOR CORN

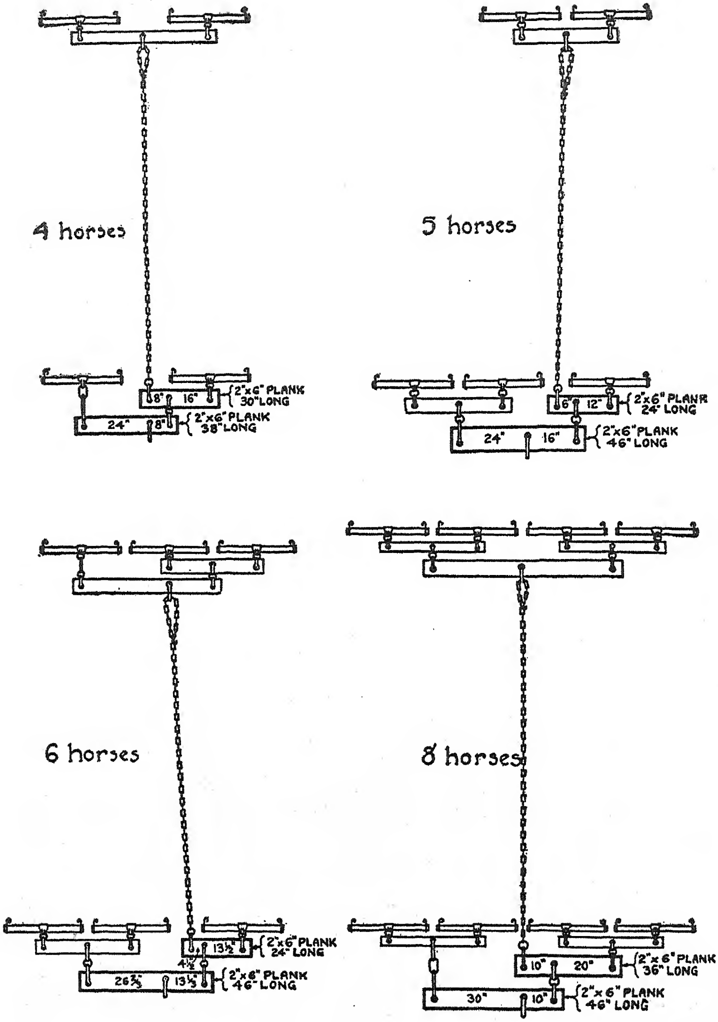
An economical outfit which does the job well and at the rapid rate of 50 acres per day. Owner, Chris Gerber.

eliminate side draft and permit proper equalization of the draft. These hitches are particularly useful in soil preparation. They make possible the plowing of an acre per horse per day and, with right soil conditions in spring plowing, they will permit the pulling of a smoothing harrow behind the gang plow. Big team hitches are also very satisfactory on binders, combines, and corn-pickers.

Field experience and experimental evidence indicate that the most practical evener for the big team hitches is the double-lever evener, or Talkington hitch, which has been advocated by numerous agricultural college extension staffs and by the Horse Association of America. This hitch has been used in the West for years and has been used in the Middle West during the past five years.

The short ends of the eveners work lower than the long ends. This prevents binding and also helps to preserve a similar angle of traces for all the horses. Eveners for this hitch have the advantage that they may be made at low cost on the farm. Sound 2″ × 6″ or 2″ × 8″ hardwood planks, bolted through the ends, should be used. Clevises should be strong and connecting links should be of proper length to keep the singletrees of the rear horses all in line. The necessary singletrees and the log chain are regular parts of the farm equipment. The accompanying diagrams give dimensions for medium-sized horses; for very large horses the widths may be increased without interfering with the working of the hitch, provided care is taken to preserve the proportions.

Harness for big hitches should be strong but simple in construction. The accompanying cuts show the construction and application of buck ropes and tie chains, and also a halter bit which saves time. In starting with the hitch it is well to adjust the buck ropes fairly tight. It is important always to have a big enough load to prevent the implement from being pulled by the bits of the horses when they are bucked back. In going to and from the field, use a weight behind the gang-plow. The bull wheel of a discarded binder is satisfactory for this purpose. Always exercise precaution in driving at the turns when the plows are out of the ground. "Green" horses can be safely worked in a big hitch; however, it is always necessary to have a well-broken, reliable, prompt, good-walking lead team. Use enough horses in the team so that they may keep moving. Always hitch the slower horses in the rear. With the use of good judgment and patience at the start it is surprising



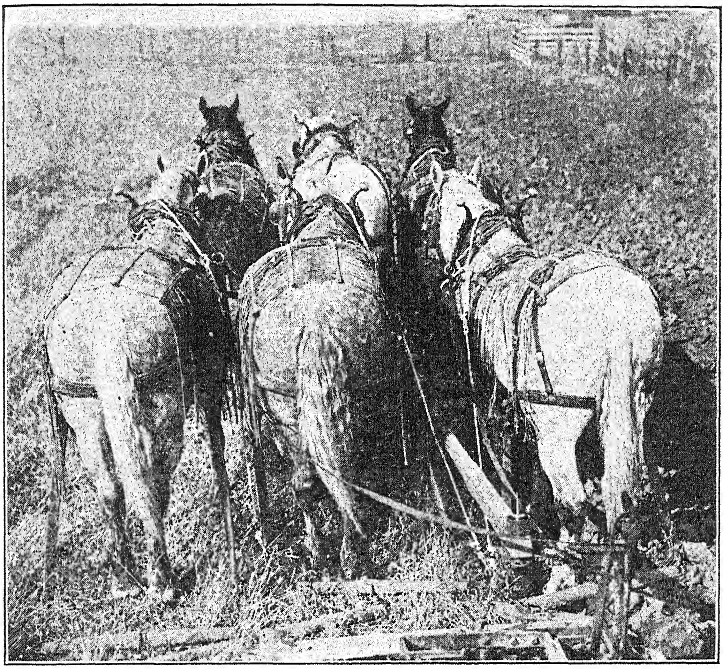
Courtesy of University of Illinois

FIG. 78.—TALKINGTON EVENERS

"The four-, five-, and six-horse hitches are good for a two-bottom gang; the eight-horse team can be used for a three-bottom plow, a tandem disk, or other large implement." (Ill. Agr. Exp. Sta. Cir. 355.)

how quickly horses learn their places and how easily they are handled.

(*d*) *Using Judgment in Handling Horses.*—Always warn a horse of your approach by speaking to him; failure to do this may startle him and cause him to jump or kick out with a hind



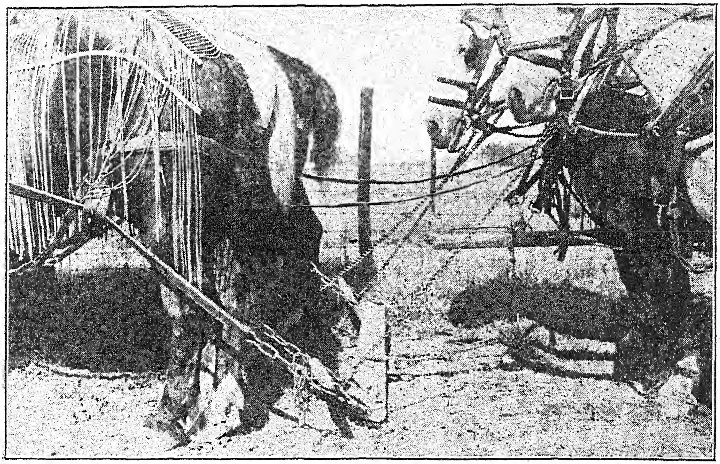
Courtesy of University of Illinois

Fig. 79.—Buck Ropes

Special care should be taken in their adjustment. (Ill. Agr. Exp. Sta. Cir. 355)

foot and injure the thoughtless party or some one else who may be near. Quick, excited motions and boisterous talk disturb "high-strung" horses and those that have been handled but little. Such treatment is never practiced by successful caretakers with any class of horses. Remember that with horses the near side is the left side—the one to approach when mounting

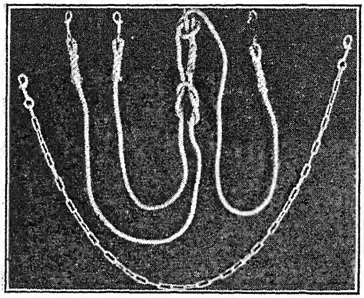
or handling; the off side is the right side. Thus we talk about the near foreleg, off hindleg, etc.



Courtesy of University of Illinois

FIG. 80.—LEAD CHAINS
(Ill. Agr. Exp. Sta. Cir. 355)

To be successful the driver must be sympathetic towards his team; he must care for the details which make for their comfort. He must be skillful in anticipating a horse's intentions before action takes place. With most horses the position and movements of the ears constitute a reliable indicator of intended conduct. The best drivers have "light hands"; that is, they feel the horse's mouth through the reins and exert, under ordinary conditions, just enough pressure to steady their teams. It is important to

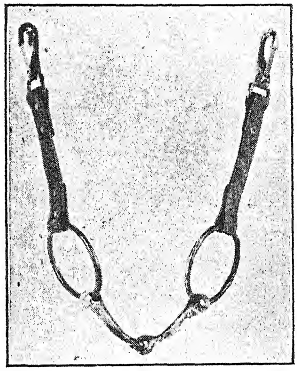


Courtesy of University of Illinois

FIG. 81.—BUCK ROPE AND LEAD CHAIN
(Ill. Agr. Exp. Sta. Cir. 355)

drive a straight line and to teach horses to walk rapidly. The walk is the business gait of the draft horse; he should not be permitted to jog but taught to walk.

It is very important to condition horses properly before they are put to steady hard work. Much is gained by getting work horses gradually hardened into their jobs while the weather is still cool during the early spring. When the horse is being worked, short rests are preferable to long ones; a hot horse may be foundered by standing any length of time in a cool breeze. During very hot summer weather horses are safe as long as they are sweating freely and breathing normally. When they stop sweating and begin to pant, serious trouble is ahead unless immediate precautions are taken. Horses which naturally sweat but little are more frequently overcome by the heat than those which sweat freely. Drooping ears, standing with legs braced, and staggering are other signs of impending danger. When a horse gives signs of being overheated, he should be quickly taken to the shade, his bridle and harness stripped off, and cold water applied on his head and legs. Severe cases will require veterinary treatment. A horse that has once been overcome by the heat should not again be used during excessively hot weather, because being overheated once makes a horse much more susceptible to future trouble from high temperatures. Although it is easily possible to be "horse-poor," an extra horse to "fill in" when needed to save another horse frequently proves to be a good investment. It is neither humane nor good economy to strain or overwork horses of any kind.



Courtesy of University of Illinois

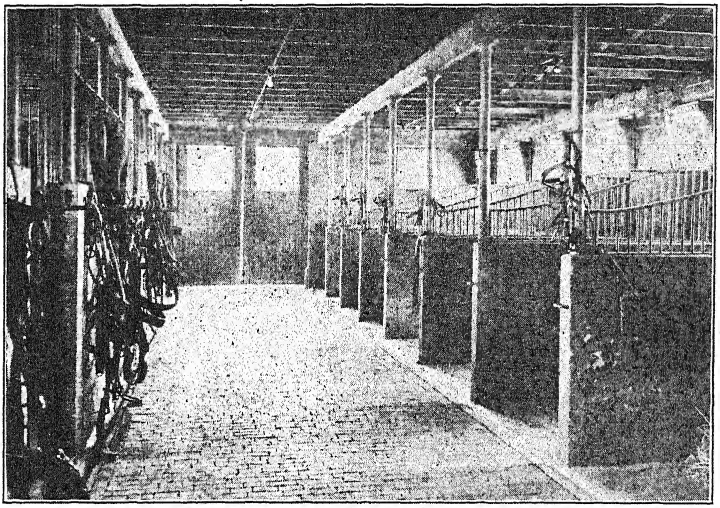
FIG. 82.—BIT AND SNAPS FOR MAKING A HALTER BRIDLE (Ill. Agr. Exp. Sta. Cir. 355)

4. Giving Stable Care.—

Considerations:

(*a*) Providing good stable arrangements.
(*b*) Grooming.
(*c*) Caring for the feet.

(*a*) *Providing Good Stable Arrangements.*—Since the horse is an outdoor animal, the farm horse, within reason, should be kept



Courtesy of University of Illinois

FIG. 83.—INTERIOR OF CLEAN, WELL-LIGHTED AND STRONGLY-CONSTRUCTED WORK-HORSE STABLE

outdoors as much as possible. It is cheaper and keeps him healthier. Open sheds are satisfactory for idle horses even during cold weather. Horse stables should be light, dry, airy, and free from drafts. The healthy horse stands cold well, provided he is protected from drafts. Where horses are kept in stables a portion of the time during hot weather, slat doors should be provided for ventilation and the stable darkened. Grating at the top of partitions also aids ventilation. Gunny

sacks may be suspended from the ceiling to help keep flies off the backs of the horses.

Work horses are ordinarily kept in standing, or straight, stalls. Stalls 5 feet wide from center to center of heel post and 10 feet long are satisfactory for medium-sized work horses. Horses 1800 to 2000 pounds should be kept in stalls 6 feet wide and 12 feet long. Long stalls make for safety. In them it is not so easy for horses to kick each other, and the extra length prevents a horse from getting his hindlegs caught around the heel post. Wide stalls help to prevent a horse from becoming cast in his stall. Horses are more comfortable and rest better when they can lie down and properly stretch out.

Box stalls are necessary for stallions, brood-mares, young stuff, ailing horses, and horses which are being fitted for show. For such animals even a small box stall is usually to be preferred to a single, or standing, stall. Box stalls are usually made square and in size range from 8 to 16 feet on a side. Occasionally box stalls used for housing extremely valuable stallions are made 20 feet square. Some owners prefer box stalls which are a few feet longer than they are wide. They believe that this shape of stall insures more walking about by the occupant.

There is no best floor material for all sorts of stalls. Clay is usually preferred for box-stall floors. Clay floors require repairing and partial renewing every six months. They are unsatisfactory for standing stalls which are being used by work horses as they soon wear into holes and provide poor drainage. Roughened cement and brick floors on a concrete base are used in some work-horse stables. Hardwood planks are sometimes used; they are expensive to renew. Creosoted hard-pine blocks set on a concrete foundation laid on sand and tarred between the cracks, have made very satisfactory floors for stalls and stable passageways. During cold weather it is necessary to use coarse sand on the creosoted block floors to prevent slipping. This floor is sanitary, comfortable to the horse, wears well, and can be easily and cheaply repaired.

Floors should slope only to as slight a degree as will permit drainage. Open drains are preferred; closed drains clog up and are the source of bad odors. Strong material should always be used in stall construction. " Good-feeling " horses test the strength of the material.

The stalls should be supplied with plenty of bedding. The hard-worked horse deserves it; besides, it conserves fertility. Horses will lie down in daytime when their stalls are comfortably bedded.

(*b*) *Grooming.*—Learn how to groom a horse thoroughly, as this is an essential part of the care of all stabled horses. Grooming adds to the appearance of a horse, but the main reason for doing it carefully and regularly is to assist in keeping the skin and coat healthy. Keeping those parts clean upon which pressure of collar and other parts of the harness come aids in preventing them from becoming galled. The necessary grooming tools are a dandy brush; currycomb, humane or reform type preferred; rub rag; hoof pick, and sweat scraper. When particular attention is given to securing an extra glossy coat, a good body brush of bristles will be needed. With farm horses, however, the work can be well done, and much more speedily, with the dandy brush.

The currycomb is used to loosen up dirt which has caked on the coat. This should be the first step in grooming. The tool should be used in a circular direction and the pressure should be only enough to get results and not irritate the skin. Keep the currycomb off the head of the horse and do not use it on the knees, hocks, or the parts below them. Following the use of the currycomb the brush should be vigorously applied in the direction in which the hair lies. Stand far enough away from the horse to enable the use of considerable body pressure in your strokes. Start in at the head and proceed over the whole body. Remember to brush thoroughly all parts of the leg, particularly under the fetlocks. The brush should be cleaned occasionally by passing it over the currycomb; from there the dust may be easily knocked on the floor. Muddy

legs should not be washed but the mud allowed to dry and then thoroughly brushed out. Brush out manes and tails faithfully because, when neglected, the skin from which the long hair grows becomes itchy, and this leads to rubbing. Do not use cards or currycombs on manes and tails because they break off too much hair.

The rub rag should be used in finishing the grooming to remove the surface dust. Rub rags are also used after the sweat scraper in some cases—although not as a rule with farm work horses—to dry horses which are brought in hot and wet with sweat. When finishing the grooming it is a wise plan to pick out a horse's feet. At this time the condition of the hoof and the shoe should be noted.

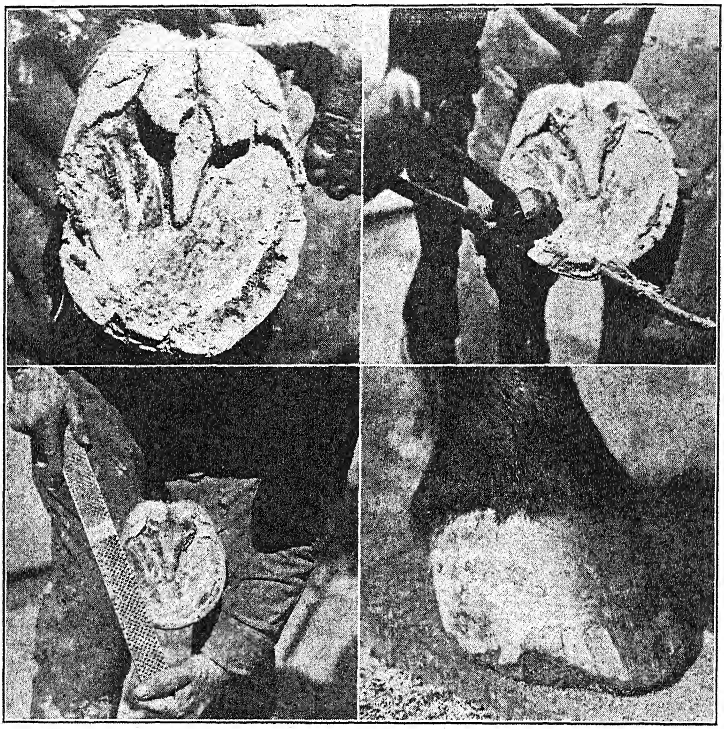
Although seldom practiced, the best time to clean the horse is in the evening after he has cooled out from his day's work. A light grooming is all that is then necessary in the morning. Do your work well and with speed; time will not permit more than the bare essentials and there are a number of practices of the experienced groom which have to be omitted for lack of time.

Neatness is added to a horse's appearance by clipping the long hair on his poll underneath the crown-piece of the bridle; by shortening the hair in his ears and underneath his jaws. Light horses usually have the long hair on fetlock, back of pasterns, and around hoof-head shortened by clipping. Grooms of heavy horses are able to improve the appearance of their charges' legs by skillful scraping, plucking, and hand-rubbing. Styles as to manes and tails vary greatly with the times and the kind of horse. Many horse lovers think that nature is not improved on by a number of these practices, some of which are foolish and others barbarous.

Light horses used at fast paces during the season when their coats are normally long and heavy are usually clipped and kept heavily blanketed when not in use. Work horses and mules, wintered mostly in the open, are benefited by having the coats clipped off in the spring before being put to heavy, hard work.

They must be blanketed for a time when not being used. Cheap burlap blankets are satisfactory for this purpose.

Blankets are used, for the most part, on farm horses that



Courtesy U. S. D. A.

FIG. 84.

Upper left, untrimmed left foot; upper right, showing use of nippers in trimming left forefoot; lower left, showing use of rasp on left forefoot; lower right, a bad break in the wall of the foot. (Farmer's Bulletin No. 1535.)

have to stand exposed to the winter elements while waiting for loads or their drivers. It is a wise precaution, during the winter season, to blanket horses that come into the stable very hot. Putting a big handful of straw over the loin and under the

blanket aids in cooling them out. Sick horses frequently require blanketing. The doors and windows in the horse barn should be arranged to prevent drafts.

(c) *Caring for the Feet.*—The feet of colts and mature horses

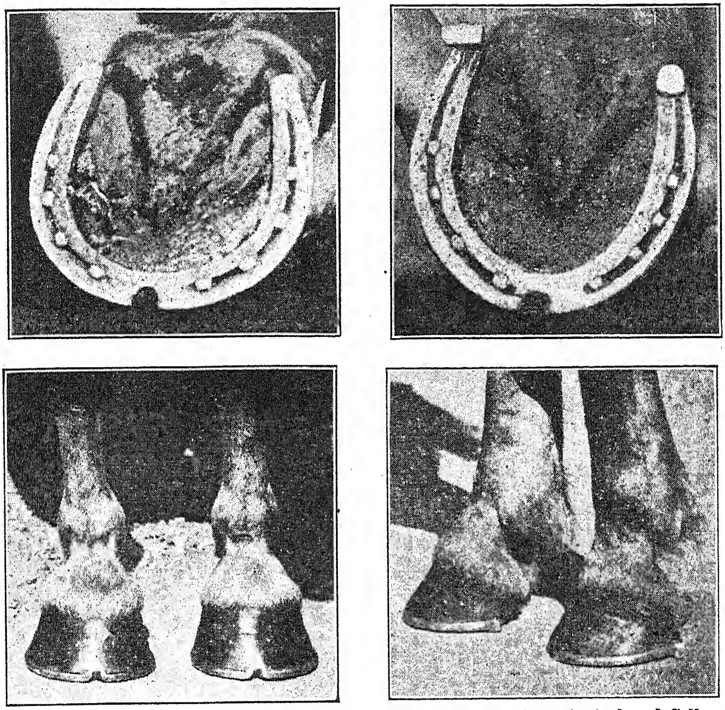


Photo by Livestock Photo Co. *Courtesy of Michigan Agricultural College*

FIG. 85.—GOOD SHOEING AND GOOD FEET

The Belgian Champion Mare Pervenche shod for the show ring by Jack McAllen.

should have a regular monthly inspection and be trimmed whenever they need it. Regular, skillful attention not only will make the feet wear better, but frequently will help to overcome defective action and faults in the conformation of the feet and legs. First remove uneven projections of the hoof wall

and any loose pieces of horn with the nippers, and then level the wall by means of the rasp so that the foot stands square and plumb. In finishing, rasp a good bevel on the ground surface of the hoof-wall all the way around the foot. This is an important practice because it does much to prevent the chipping and cracking of the hoof-wall. Normal unshod feet may be kept in good condition by the use of a carpenter's chisel and a mallet or hammer. A long-handled chisel is safer to use with green horses.

Horses which do much work on pavement or gravel roads will require shoeing. Usually this is done by the trained farrier, or horseshoer, if one is available. Unfortunately they are becoming very scarce in many communities. Some farmers are overcoming this difficulty by purchasing and applying ready-to-wear horse and mule shoes. The use of these shoes for work stock is a boon to farmers in territories which are without the services of a qualified horseshoer.

The feet of shod horses occasionally dry out. Packing overnight at weekly or shorter intervals with wet clay will overcome this difficulty. The use of neat's-foot oil on the hoof-wall is also of some benefit. The application of hot pine tar to the hoof-wall seems to toughen that portion of the foot. Unshod horses usually run out and the dew and the rains keep their feet well supplied with moisture.

5. Providing Proper Harness.—

Considerations:

(*a*) Selecting and fitting farm harness.
(*b*) Cleaning and oiling harness.

(*a*) *Selecting and Fitting Farm Harness.*—"A team well harnessed and put together is half driven." There are many different styles and weights of harness. Heavy breeching harness is in place where heavy teaming is done. On farm harness a profusion of heavy brass mountings is not desirable; such mountings, however, have a place on show harness. Lighter, simpler harness is in order for field work; harnessing

and unharnessing is a lighter job and the horse is burdened with less dead weight. It always pays in the long run to purchase good leather and good workmanship. Many runaways have been caused by using too light or too weak harness.

Collars should fit snugly at the sides with just space enough to permit the fingers being run down one side between the collar and the neck. They should be long enough to give 1½ inches of space below the windpipe when they are shoved back hard against the shoulder. Short collars choke a horse down when he is being pulled hard. Buy a regular half or full sweeney type of collar, depending upon the shape of the horse's neck. Mules require a full, or high-faced, collar. The face of a new leather collar should be thoroughly oiled with warm neats' foot oil the day before it is used. Each horse should have his own collar. A heavy leather one is preferable. It should be slipped on and off over his head in order to prevent its breaking at the throat.

Hames should be big enough to fit the collar; they should lie snugly in the seam and always be kept buckled tightly. New collars are sometimes ruined by careless buckling of the hame straps. The trace attachment to the hames should be at the point on the shoulder where there is least movement. This is usually about one-third the distance above the point of the shoulder. The trace should pull at right angles to the hames. Proper adjustment of back and belly band will keep this angle.

Bridles should fit fairly snugly but brow bands should not pinch the ears. The bit should rest in the mouth just high enough so as not to wrinkle the corners of the mouth. It should not be so low as to tempt the horse to put his tongue over it. A smooth, hinged snaffle bit will be found best for most mouths. Great care needs to be exercised in the selection and use of severe bits; frequently they aggravate the condition they are used to correct.

(*b*) *Cleaning and Oiling Harness.*—Farm harness should be thoroughly repaired, cleaned, and oiled once or twice each

year. This is a good rainy-day job. Take the harness apart and soak it for 15 minutes in tepid, soft water in which has been dissolved a neutral soap (use washing soda also in hard water). Scrub and wash each strap and rinse in clean water. Hang up the harness and allow it to become nearly dry. Use edge blacking where required and oil the harness while it is still damp. The oil and harness should both be warm and the oil thoroughly rubbed in. Some harness makers prefer dipping the harness in a warm oil bath.

Neat's-foot oil, castor oil, or a mixture of neat's-foot oil and tallow are all satisfactory for heavy harness. The compound harness oils sold on the market by petroleum companies are likewise satisfactory.

Leather collars should be cleaned daily during the season of hardest farm work. Sponge them off at night with tepid water, a clean cloth, and soap. This is a more satisfactory way of cleaning them than trying to scrape off the dried and caked sweat the next morning with a knife. Clean, well-fitted collars and clean shoulders go a long way toward preventing loss of time during a busy season because of sore necks and sore shoulders.

COMMUNITY STUDIES

Study the methods of farmers who are successfully raising and training the horses used on their farms. Frequently the breeders and dealers who sell stallions and mares for breeding purposes have had valuable experience in the management of brood-mares and stallions. Obtain information on as many of the following practices as possible:

1. Management of the brood-mares:
   - (*a*) Work done by the brood-mares?
   - (*b*) Breeding for spring or fall foals?
   - (*c*) Preventing joint-ill?
   - (*d*) Weaning the foal?
2. Training colts:
   - (*a*) Age when put to work?
   - (*b*) Methods used in handling colts and "green" horses?
   - (*c*) Training for the saddle?

3. Working horses:
   (*a*) Methods of driving and hitching big teams?
   (*b*) Precautions taken during hot weather?

4. Care in the stable:
   (*a*) Methods of cleaning stables?
   (*b*) Methods and tools used in grooming?
   (*c*) Foot-trimming?

5. Harness:
   (*a*) Style of harness used?
   (*b*) Method of cleaning and oiling harness?
   (*c*) Repair work on harness?
   (*d*) Care in fitting collars?

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Note. See also the references in Chapters IV, X, XIII.

CHAPTER XVII

MANAGING SHEEP

LITTLE profit can be made in sheep raising without skillful management. Many features of modern sheep husbandry are based on science and can easily be understood as important. There remain numerous details, however, which the novice might pass over unnoticed or consider as inconsequential, but which the experienced manager knows must be given careful attention. The purchase of well-bred animals and the use of good rations do not assure a successful flock. In addition the shepherd must be constantly on the watch for the individual needs of his flock and provide for them before any trouble becomes serious. He must seek to have each animal produce efficiently and without undue expense. Neglect or lack of skill or knowledge on the part of the shepherd will make a mediocre flock of one which might have had outstanding merit and productiveness.

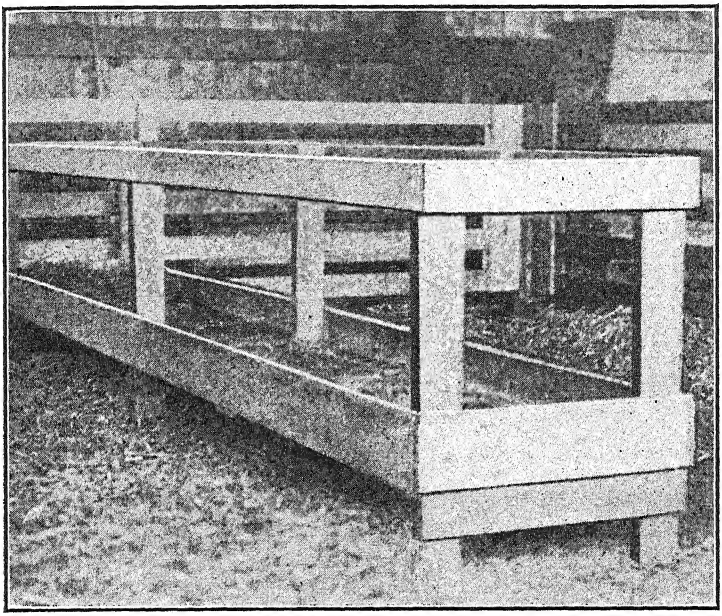
Management Problems:

1. Planning buildings and equipment.
2. Managing the flock at breeding time.
3. Caring for bred ewes.
4. Caring for ewes and lambs at lambing time.
5. Caring for young lambs.
6. Caring for the flock during the summer.
7. Managing western feeding lambs.

1. Planning Buildings and Equipment.—Relatively simple buildings are satisfactory for sheep in most localities. Barns or sheds which are dry, well ventilated, conveniently arranged,

and inexpensive are entirely suitable. Since sheep are seldom confined individually except at lambing time, their housing requirements are very different from those of dairy cattle and horses.

Sheds opening on the south are adapted to all classes of



Courtesy of University of Illinois

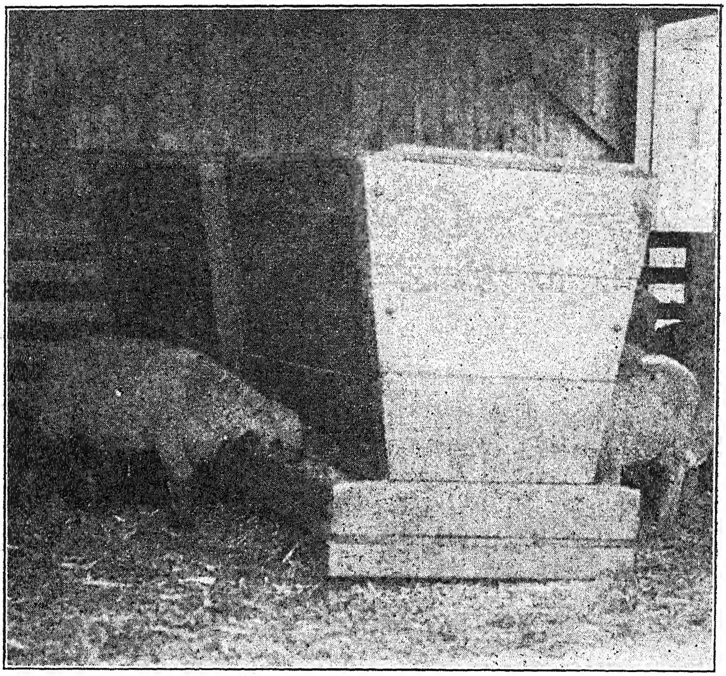
FIG. 86.—A SUITABLE FEED RACK

Concentrates and roughages may be fed in such a rack. Vertical slats may be used on the sides or the top board may be lowered or raised to make the rack suitable for sheep of various sizes.

sheep except early lambs in sections where it is apt to be very cold. However, if a part of such a shed is enclosed temporarily, it will afford ample protection for young lambs, except those born during extremely cold weather.

Although sheep are usually handled as a group, it is often necessary to have individual pens in which to confine some of

them, especially ewes with new-born lambs. Since these pens are used only a few days each year, temporary ones are suitable. One of the best and easiest ways to make them is to set up light 4-foot hurdles.



Courtesy of University of Illinois

FIG. 87.—A SELF-FEEDER

Fattening and growing lambs may be self-fed if the ration contains much bulk. This 12-foot feeder will hold more than one-half ton of a mixture of ground roughage and grain and is large enough for 30 or 40 lambs.

Feeding equipment may be made in various ways. Cost, ease of construction, of repairing and cleaning, and adaptability to various kinds of feeds and classes of sheep are important items to consider in selecting feeding equipment. A few types

of feed racks and troughs are shown in the accompanying illustrations. Facilities for watering may be very simple. Small metal or wooden tanks are used for many farm flocks. A constant supply of clean, fresh water is indispensable in a well-managed flock.

Shade adds so greatly to the comfort of sheep in hot weather that it should always be accessible to them. If trees or sheds are not conveniently located, temporary shades may be built.

Because of the troublesomeness of dogs in some communities, it is often a good policy to have a corral fenced with "dog-proof" fencing, in which sheep may be enclosed at night, especially if they are pastured some distance from the house. Some sheep raisers put bells on one sheep of every ten or twenty in the flock, believing that this practice helps to keep dogs from troubling the flock.

2. Managing the Flock at Breeding Time.—The objects sought at breeding are to have all the ewes breed in a relatively short time and to have them in such condition that they will produce a large lamb crop. The ways of accomplishing the latter object are discussed in Chapter XI, "Feeding Sheep."

Considerations:

(*a*) Determining when to breed ewes.
(*b*) Preparing ewes and rams.
(*c*) Making sure ewes are bred.

(*a*) *Determining when to Breed Ewes.*—The gestation period of ewes averages 147 days, with a range from 142 to 152 days. This varies to some extent with breeds: Rambouillets tend to the longer period, while Southdowns often drop lambs earlier than the average time. Thus, if it is desired to have the lambs born about February, the mating season will be during September. Careful flock masters will know the date the ewes should begin lambing so that they may make preparation accordingly. The mating season of ewes usually extends from about the first of September to the last of December, although there

are ewes of some breeds that may be bred during other months. Heat periods occur at approximately 17-day intervals during this time. The duration of a period is generally not more than one day.

(b) *Preparing Ewes and Rams.*—The ewe flock should be looked over at the beginning of the breeding season and all tags and dirty locks of wool about their hindquarters removed with a pair of shears. This should not be a great task as it is good practice to remove tags as they accumulate. Often the toes will have grown very long and need to be trimmed. Small pruning shears or a knife may be used. It is particularly important to keep the feet of the ram in good condition. Sometimes long wool needs to be clipped from the underline of heavily fleeced rams. In fact, it is not unusual for sheep raisers to shear rams about the beginning of the breeding season if they are to be used with a large number of ewes. One ram is usually placed with about 40 ewes; three rams with 100 ewes. If hand mating is practiced a vigorous ram may be used on more than 40 head. Rams often do better if they are turned with the ewes for an hour or two night and morning and then kept apart from them at other times.

(c) *Making Sure Ewes Are Bred.*—It is very discouraging to plan for a good lambing period and then learn that none or only a few of the ewes will raise lambs because the ram has proved to be a non-breeder. This is not an unusual condition, as sterility may be produced in rams by a number of causes. Barrenness in ewes is also not uncommon but the number of non-breeding ewes in a flock is not apt to be more than 3 to 5 per cent in any one year. These ewes may be discarded without greatly changing the flock. The case of sterile rams is much more serious, as it may mean the loss of an entire lamb crop. Hence it is advisable to take precautions to know whether or not the ewes are becoming pregnant. This may be done in several ways. One of the best methods in a commercial lamb-raising flock is to mark the chest of the ram with a marking fluid which will easily rub off on the fleece of the

ewes. Marking fluids may be made by mixing enough red or yellow ochre or lamp black with some oil to make a fairly thick paste. Suppose the ram is turned with the ewes the first of September. Practically all the ewes should have been in heat once during the next 17 days. At the beginning of the second 17 days a red marking fluid might be put on the ram underneath the brisket. Seventeen days later a black color might be used. If all the ewes continue to return another ram should be obtained.

In flocks large enough to require the use of three rams it is very unlikely that all three would be non-breeders. If the ewes are numbered by means of ear tags or are otherwise identified it is advisable to keep a record of most of the breeding dates.

3. Caring for Bred Ewes.—The management of bred ewes is comparatively easy if pasture or other feed and shelter are available. The essentials in winter care, aside from the system of feeding described in Chapter XI, are exercise and shelter. Without exercise ewes will not remain in good vigorous health. One of the best ways of inducing them to exercise is to turn them to pasture during practically every day, except when weather conditions make this unwise, and to place part of their feed, such as hay or perhaps some fodder, at the far end of the pasture some distance from the shelter, thus encouraging the ewes to walk to and from the feeding place. If pasture is not available, a dry lot about 40 by 100 feet in dimension may be used so as to afford sufficient room for exercise for a flock of of 30 or 40 ewes. Violent exercise is undesirable, particularly when lambing time is near.

Overcrowding in poorly ventilated shelters must be avoided, as it is a frequent cause of colds and illness in sheep.

Good methods of handling sheep are important at all times but particularly so during the pregnancy period. Rough handling must be avoided. When it is necessary to catch a ewe or other sheep, grasp it by the rear flank or leg or under the jaw and hold it by the loose skin under the jaw. Lead it by

keeping hold of it under the jaw with one hand and pushing it along with the other hand placed at the dock. A skillful shepherd never takes hold of the wool or pulls it in any way. To set a sheep on its rump or place it on its side to attend to its feet or other parts, hold it by placing one forearm under the neck just in front of the shoulders and then with the other arm reach over its back and grasp the flank, lift up, and set the sheep down. Be careful not to twist its legs. Instead of reaching over to get hold of the flank, one may reach under the sheep and take hold of the hindleg on the far side, pull it slowly under the sheep, and lift up on the forequarters.

4. Caring for Ewes and Lambs at Lambing Time.—The lambing period requires a high degree of skill on the part of the flockmaster if he is to raise every lamb that is born alive and strong. Properly fed and managed, a flock of healthy ewes should produce strong, vigorous lambs. Neglect and lack of knowledge will result in heavy losses. Even with the greatest of skill there are likely to be a few losses because of accidents and perhaps disease, but these should be prevented so far as possible.

Considerations:

(*a*) Assisting at lambing.
(*b*) Guarding against disease.
(*c*) Helping the lambs get a start.

(*a*) *Assisting at Lambing.*—Experience soon teaches one to recognize the indications of approaching parturition. The ewe is restless and has little or no appetite, the muscles of the rear quarters become very relaxed, and the udder and teats are full. When these signs are observed the ewe may be placed in a lambing pen which is clean and well bedded. In most cases she will not need assistance. She should be observed, however, from time to time to learn if the lamb is being delivered.

If the birth of the lamb seems unduly delayed, careful assistance should be given. In doing this be sure to take every possible precaution to avoid infection and injury. Wash the

hands thoroughly, using some good antiseptic on them, and do not touch anything from which dirt or germs might be carried into the ewe. Working very gently, first determine what is wrong and if possible correct the difficulty. It may be necessary to insert the hand into the ewe in order to get the lamb into the proper position. In normal delivery the forefeet of the lamb are extended with the head between the knees. Occasionally delivery is made with the hindlegs presented first. If the ewe still has difficulty, give further assistance by pulling on the legs of the lamb when the ewe labors. This should never be done, however, until you have found and corrected the cause of non-delivery. The rules of giving assistance, then, may be summarized as: (1) Be clean; (2) be gentle; (3) find the trouble and correct it, making sure that the lamb is in the right position for delivery; and (4) give assistance as the ewe labors. If after a reasonable length of time the ewe still fails to deliver the lamb a competent veterinarian should be called.

Sometimes lambs are born fully or partially enclosed in the membranes. These may smother the lambs if the attendant is not on hand to remove them.

(*b*) *Guarding against Disease.*—Sheep are not so susceptible as some other classes of livestock to many contagious diseases, such as tuberculosis and Bang's Disease (abortion). There are other diseases, however, which cause large losses among sheep and these should be avoided if possible. It is especially important at lambing time to guard against diseases, for it is difficult to treat very young lambs that are sick. The first essential in avoiding trouble is sanitation. Have the lambing pens thoroughly cleaned and bedded with clean straw. Soon after birth treat the lamb's navel with tincture of iodine or other efficient disinfectant. Immersing the navel cord in iodine contained in a wide-mouthed bottle is a good plan. Many lambs die and many more are unthrifty because of navel infections. Many cases of "stiff lambs," lame lambs, pneumonia, and abscesses of the liver or other organs may develop because

of lowered vitality due to infections of the navel soon after birth.

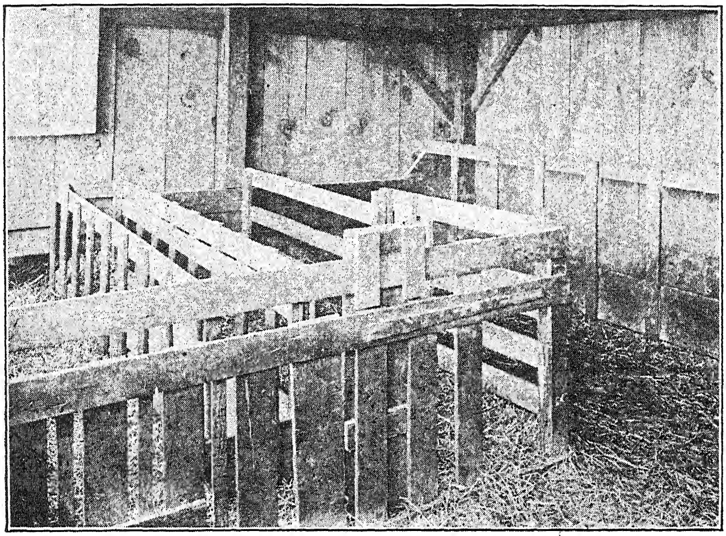
Do not let the lambs become chilled. During extremely cold weather it may be necessary to visit the barns at night to make sure that the lambs are warm. Chilled lambs often develop pneumonia. If a lamb should become chilled, warm it slowly by placing its body in warm water or by wrapping it in a blanket. Do not "cook" it by placing near a hot stove. It should be assisted to obtain some of its mother's milk if it is too weak to nurse alone. Some shepherds also give various stimulants, but these are not necessary except in extreme cases.

(c) *Helping the Lambs Get a Start.*—When lambs are born vigorous and strong they are soon anxious and able to nurse. In order to be sure that the ewe has milk and that the lamb can get it from the teats, a little of the milk should be drawn by hand. Lambs may starve because teats are not open. Milk from a caked or spoiled udder is very likely to cause sickness of the lamb.

If ewes lamb before they are shorn it is a great help to the lambs if the long wool is clipped off at the flank and about the teats. Unless this is done young lambs may suck a lock of wool on the udder because they are unable to find the teats. Furthermore, these dirty locks of wool may cause sore eyes in lambs. Late-lambing ewes may be shorn before parturition if handled carefully. This is a great help to the lambs.

Some ewes seem to be lacking in maternal instincts and will not care for their lambs nor let them nurse. Such ewes are often not good milkers and should be discarded before the next season. Various methods are used in trying to make such a ewe raise her lamb. She may be tied in a small pen or held while the lamb nurses, or some of her milk or some oil or other material may be rubbed on the lamb and also on her nose, as ewes recognize their lambs by their sense of smell. Many other devices and "tricks" are used, but there is none that will compel a really stubborn ewe to own her lamb.

Provide a creep for lambs, particularly those born before grass is available, so that they may be given an abundance of feed after they are about two weeks of age. Even late-born lambs may do better if creep-fed, as pastures may become short. Each year thousands of lambs on our central markets are an evidence of the fact that those which are fed grain are in much higher condition than those fed grass alone.



Courtesy of University of Illinois

Fig. 88.—A Lamb Creep

The lambs enter the creep where they eat apart from the ewes. A suitable feed rack for lambs is shown in the creep; also one for the ewes along the side of the shed.

5. Caring for Young Lambs.—Lambs should be marketed as docked wether and ewe lambs. This means that all young lambs that are intended for market must have their tails removed (docked) and all male lambs must be castrated. To raise and ship to market lambs that have long tails and that are not castrated is to go contrary to the demands of our present-

day trade. Neglect of these practices will mean reduced returns.

Considerations:

(*a*) Determining most desirable conditions for docking and castrating.
(*b*) Docking.
(*c*) Castrating.

(*a*) *Determining Most Desirable Conditions for Docking and Castrating.*—Lambs do not suffer a great setback if docking and castrating are done by a careful operator under sanitary conditions. If one is not experienced in these operations it is unwise to attempt them without the assistance of a veterinarian. It is also unwise to attempt them if sanitary conditions cannot be provided, as the danger of infection then becomes a great hazard. It is important that weather conditions be favorable. Cold, wet weather is entirely unsuitable. Probably the best age for the lambs to have attained is approximately two weeks. It is not so important, however, that the lambs be any exact age as that they be healthy and vigorous and that the weather and sanitary conditions be favorable for the work.

(*b*) *Docking.*—Various methods are used in docking lambs. Any method which is not extremely painful, that does not permit a great loss of blood, and that guards against infection is likely to be satisfactory. Knives, shears, hot irons or pincers, emasculators, and other such tools are used. Each tool has its advocates; each its advantages and disadvantages. In general, the use of sharp tools is followed by loss of blood unless the dock is tied or seared afterwards. Heated irons prevent bleeding but delay healing. Emasculators are somewhat expensive but prevent bleeding without delaying healing.

The lamb is held by an assistant, who grasps both right legs in his right hand and both left legs in his left hand. The lamb may be set on its rump if hot irons are used or held against the body of the assistant if some other tool is used. The operator

removes the tail at from 1 to 1½ inches from the body of the lamb. Tincture of iodine or some other equally good antiseptic should be applied to the wound. If a knife is used and bleeding is excessive it may be checked by tying a fairly heavy cord tightly about the dock. This need not be left on for more than two or three hours. The accompanying illustration will be helpful in learning how to hold lambs and dock them.

Courtesy of University of Illinois

FIG. 89.—DOCKING A LAMB

This is a good way to hold a lamb while docking and castrating it.

(c) *Castrating.*—In general, there are two methods of castrating lambs. The method most commonly used in the corn belt is to have the lamb held as for docking and then cut off with a knife about one-third of the scrotum and draw out the testicles by grasping them one at a time between the thumb and first finger. A thorough application of tincture of iodine completes the task.

A method of castration which has been recently developed consists of crushing and severing the cords leading to the testicles by means of special castration pincers. The cords are crushed some distance above the testicles by holding the latter well down in the scrotum with the thumb and first finger. The cords of each testicle are crushed separately. The testicles are not removed from the scrotum but when the cords are severed the blood supply is cut off and the testicles atrophy. This method does not cause any loss of blood and there is apparently little if any danger of infection.

6. Caring for the Flock during the Summer.—There is a tendency to neglect flocks during the summer. This is costly

to the owner, for there are some operations which need to be done and to be done promptly during the warm weather. Not all of these are exactly summer problems, but they are associated with that time or its approach, and for convenience may be grouped together.

Considerations:

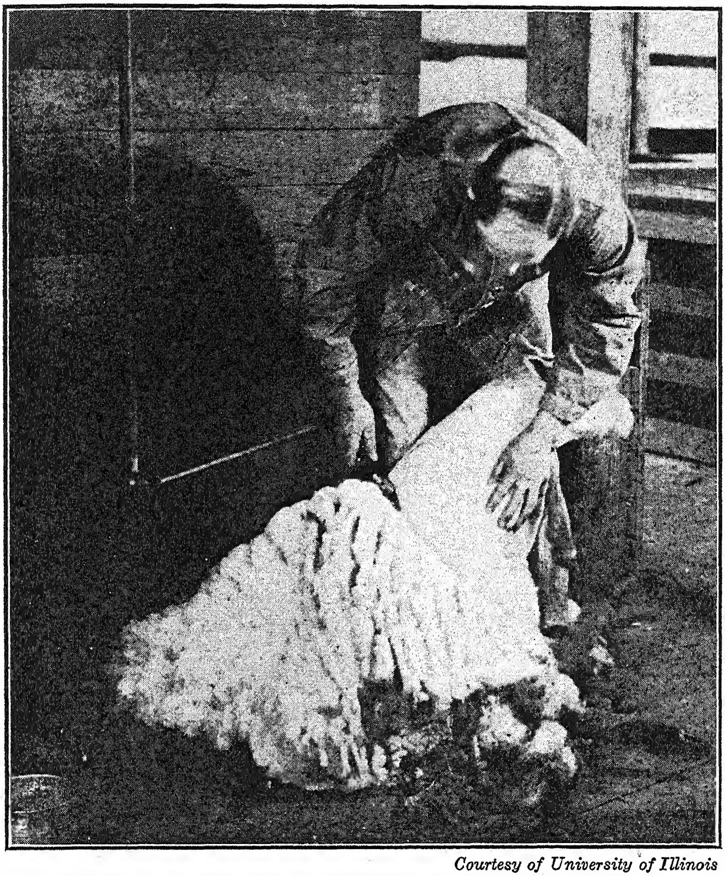
(*a*) Shearing and handling wool.
(*b*) Dipping sheep.
(*c*) Weaning lambs.
(*d*) Controlling parasites.

(*a*) *Shearing and Handling Wool.*—Shearing is an operation that is associated with the approach of warm weather; throughout the corn belt it is done about corn-planting time. Where good shelter is provided it may be done earlier if desired. Shearing should be done before sheep are turned on luxuriant pastures. Many shepherds wait for the warm weather to cause the yolk, or oily secretion, to flow more freely in the wool. This makes shearing easier and may increase slightly the grease weight of the wool. In some sections, notably Texas and parts of California, it is often the practice to shear twice a year.

There are two methods of shearing—by hand and by machine. Shearing by the use of hand shears, which of course is a much slower process, is practiced much less commonly than formerly. Power for the operation of shearing machines may be supplied by hand for small flocks or by motor when there is a larger number of sheep. Probably neither method has any effect on the amount of wool produced. Whichever method is used, care is necessary to avoid cutting the sheep and making "second cuts" in the fleece. Practice is the only means whereby shearing may be learned.

In general, the sheep should be handled carefully so as to avoid injuring it. The fleece should be shorn so that it will be practically in one piece. Shearing should not be done when

the fleece is wet nor should it be done where there is straw, dirt, or filth to get in the wool. Some attempt should be made

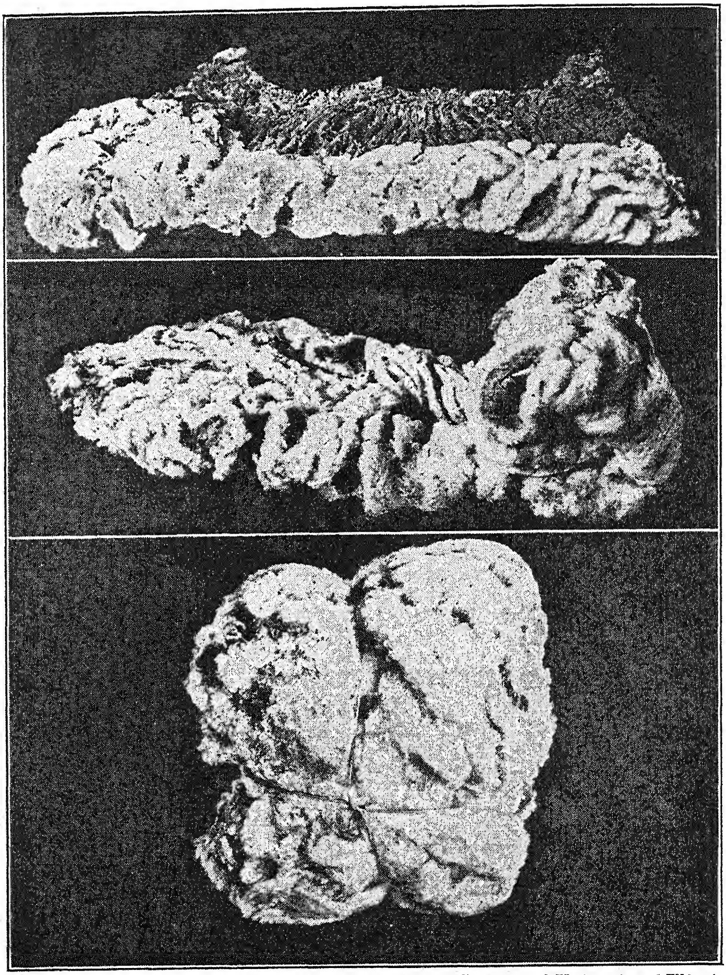


Courtesy of University of Illinois

FIG. 90.—SHEARING

During the process of shearing the sheep is held in several different positions. A skillful shearer avoids injury to the sheep and keeps the fleece in one piece.

throughout the year to keep the fleeces clean, and certainly at shearing time they should be kept as clean as possible.



Courtesy of University of Illinois

FIG. 91.—HANDLING WOOL

Care in handling the fleece after it is shorn is an inexpensive means of realizing its full market value. In the upper part of the illustration the fleece is shown skin side down on a clean floor with one side folded over. The other side is then folded over and the fleece rolled and tied with smooth paper twine.

After the fleece is shorn, place it on the clean floor or table with the cut ends of the fibers down. Spread it out completely. Remove any tags and keep them separately. Fold the legs and sides of the fleece over on top of the main body of the fleece. The fleece should then be from 18 to 24 inches wide. Then, starting with the wool from the rear quarters, roll the fleece into a fairly tight roll. It should be tied with smooth paper twine made especially for this purpose. Binder twine or other similar twines should never be used as some pieces cling to the wool and thus damage the cloth made from it. Store the fleeces in wool sacks in a dry place and protect them from mice and moths until sold.

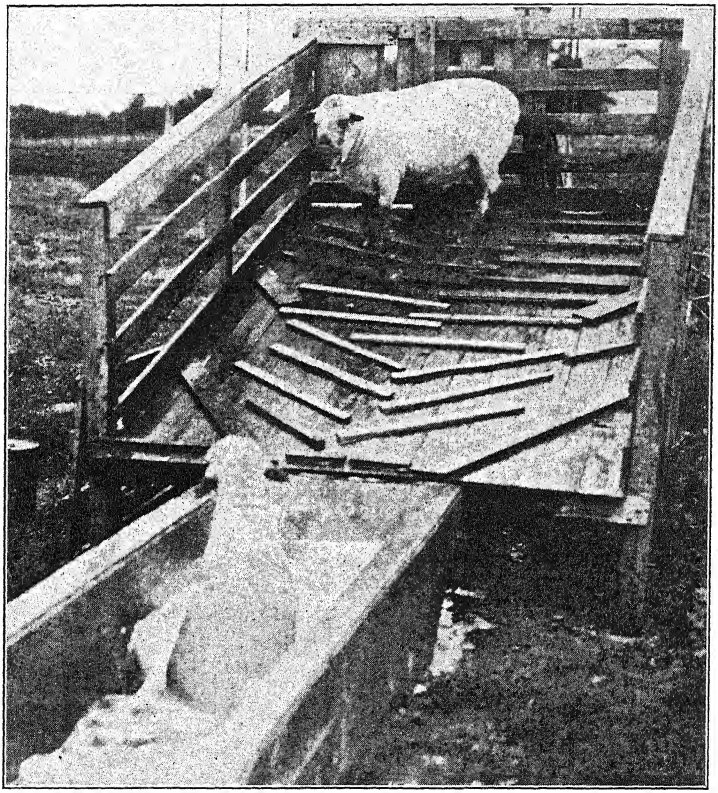
(*b*) *Dipping Sheep.*—There are several external parasites which may infest sheep. Among them are ticks, lice, and scab mites. Of these the scab mites are the most serious as they require special dipping and quarantine measures for their eradication. Any case of scab-mite infestation should be reported to the state veterinarian for attention.

Ticks and lice are commonly found on sheep in all sections of the country. They irritate the sheep's skin and cause unthriftiness. Moreover, they cause the sheep to rub and this may result in a considerable loss of wool. Infested flocks should be dipped. This is best done about a week after shearing when, because of the short fleece, much less dip is required than before shearing. The lambs should be dipped at the same time as the older members of the flock. There are several good prepared dips that may be purchased for this purpose.

For a small flock a tank is a satisfactory dipping vat. For larger flocks it is necessary to construct special dipping vats. The sheep should be completely covered with the dipping solution but care must be taken that the dip does not enter the lungs or become swallowed. It is a good plan to dip the flock twice at an interval of two to three weeks.

(*c*) *Weaning Lambs.*—Early lambs, and also many late lambs, are not weaned until they are to be marketed. Lambs which are to be retained in the flock are weaned usually when

about four or five months old. After reaching that age lambs do not need the small amount of milk they obtain from their dams and they will often grow and fatten more satisfactorily



Courtesy of University of Illinois

FIG. 92.—DIPPING SHEEP

External parasites cause unthriftiness. No other means of control is so satisfactory as dipping.

if weaned and fed a grain ration than when allowed to run with the rest of the flock during the hot summer on scant pastures. Failure to wean and provide a grain ration accounts for many

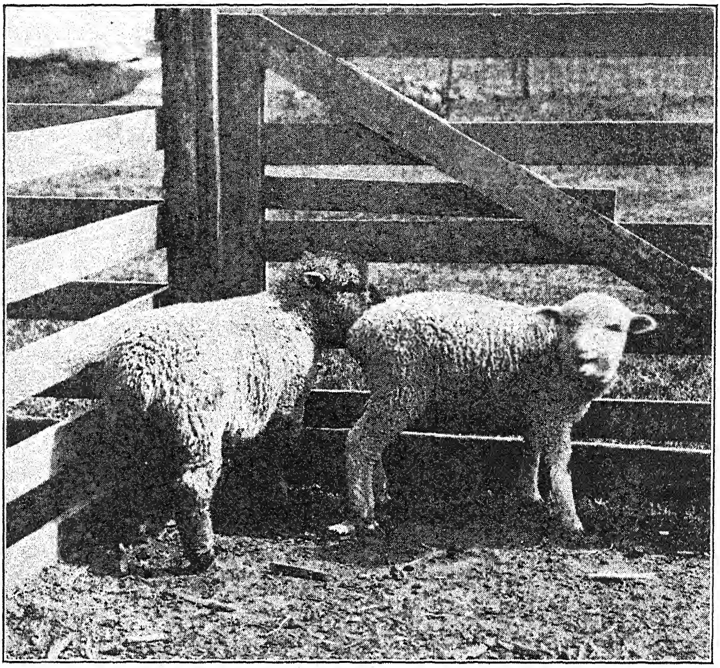
of the cull lambs sent to market in late summer and early fall. Weaning need not interfere with the growth of the lambs. Undoubtedly, the best procedure is to separate the ewes and lambs completely and keep them apart. Lambs that are used to being fed grain will not call for their mothers long. Even those not previously fed will become quiet in two or three days. After weaning there is nothing in particular that needs to be done for healthy lambs except to feed them well.

For several days after the lambs have been removed the ewes should be fed only moderately, especially if the lambs are very young and the ewes are still producing much milk. Some of them will need to be milked once or twice to prevent damage to their udders.

(*d*) *Controlling Parasites.*—Internal parasites are one of the most serious difficulties encountered in sheep raising. So far as possible it should be a regular feature of farm sheep raising to rotate pastures either by plowing and using all pastures in the regular crop rotation or by using different parts of the pasture at different times. Making frequent short pasture changes, that is, shifting the sheep on and off the pasture every week or two, is apparently much less effective than making seasonal or yearly pasture changes. The parasites, in a larval stage, may exist on a pasture for a long time, and hence if the sheep are returned after only a short period to the old pasture areas, they may become more heavily infested. Infestations are not likely to occur except under pasture conditions.

Stomach worms are found in sheep in many sections of the United States. The adult parasites are approximately $\frac{3}{4}$ to $1\frac{1}{4}$ inches long and about as large in circumference as a small straight pin. They live chiefly in the abomasum, or fourth section of the stomach. The eggs are carried with the feces onto the pasture. If conditions are favorable, the several stages of development are usually completed in the course of ten days or two weeks and the larvae are then capable of infesting animals that are suitable hosts. No pasture which is infested with these larvae can be considered clean or sanitary.

Other common internal parasites affecting sheep more or less seriously in various parts of the country are nodular worms, tape worms, liver fluke, lung-worms, and grub in the head. The most serious infestations of all these parasites occur during



Courtesy of University of Illinois

FIG. 93.—INTERNAL PARASITES HAVE CAUSED THE DIFFERENCE IN CONDITION OF THESE LAMBS

Pasture sanitation is an important part of the control measures for internal parasites.

the pasture season. Both lambs and older sheep may be treated effectively for stomach worms, tape worms, and liver fluke, but it is much more satisfactory to prevent infestations by providing pasture sanitation. Treatments for lung-worms

and grub are very seldom satisfactory. Application of pine tar to the face of the sheep close to the nostrils aids in preventing attacks by flies which are responsible for grub in the head. Such repellents must be kept on the sheep throughout the summer in localities where the flies are numerous.

Sheep are subject to attacks by blow flies. These flies deposit eggs in dirty wool, particularly about the hindquarters. The maggots which develop from these eggs burrow into the sheep, causing extreme irritation. So far as possible stained wool should be removed and pine tar applied before the maggots develop. When maggots are present a small amount of turpentine applied to the infested area is an effective means of destroying them. This treatment and an application of pine tar will aid in preventing other attacks. The flock should be watched from day to day and those sheep which are seen biting or rubbing susceptible parts should be examined at once.

7. Managing Western Feeding Lambs.—Lambs that are raised on the western ranges are usually not weaned until they are shipped to market and hence they have more of a handicap than farm-raised lambs that are weaned and kept on good feed. Feeder lambs purchased on the range are usually weighed at the loading point after they have had no feed or water for 12 hours. Then if they are loaded for shipment without being fed they may be deprived of feed and water for another period of 24 to 36 hours before they are unloaded. This means a total of almost or fully two days without nourishment. Combined with weaning and the excitement of shipping, this is certain to result in a loss of weight. Ample time to rest, eat, and drink while en route is a great help to lambs being shipped a long distance. Feeder lambs bought on the central markets have been handled the same way except that they usually have been given "a good fill" close to the market. Lambs may be held at such points for several days or longer before they are sent to the sales point. This, of course, is done to allow them to regain at least a part of the weight lost in shipment.

Lambs shipped from the western ranges as far as Illinois will generally shrink 5 to 8 pounds each. If they are poorly handled en route, the shrinkage may be much more than this. Furthermore, the shrinkage tends to reduce the vitality and resistance to diseases, such as hemorrhagic septicemia. Lambs bought on central markets generally must be dipped, unless the weather is very cold, before being shipped to farms.

Feeder lambs should be carefully handled after they arrive at the farm. They will need to be given dry roughage, such as legume hays, or placed on bluegrass pasture which is not especially green and succulent. If they are to be fed in corn-fields they will do best if they are first fed on hay for several days and then turned into the fields for only a short time—an hour is enough—when not very hungry. Gradually the period may be lengthened. Care at this time is important, for any digestive troubles will be apt to hinder gains as well as result in the death of some lambs. In fact it is a good plan to have some legume hay or grain available for the lambs throughout the period of field-feeding.

When feeding a considerable number of lambs it is good management to sort them according to size. The smaller lambs will then have a better opportunity to eat and will gain faster than when compelled to feed with stronger, heavier lambs. The larger ones may be fed greater amounts of feed and will reach market weight sooner. The smaller lambs may be "roughed" through the winter and fattened for the early spring market.

Other features of good management include the arrangement of racks and troughs so that they are easily reached by the lambs and at the same time allow the caretaker to carry on his work in the minimum of time. The pens should be well lighted and always kept clean. The feeding should be done regularly and quietly.

COMMUNITY AND FARM STUDIES

Managing Sheep

Study the management of the flock on your farm or on a neighboring farm.

1. How are the ewes and ram prepared for the mating season? Might the method of preparation have any effect on the number of lambs produced by each ewe?
2. What has been the percentage of lambs born and the percentage raised in this flock for several years past?
3. List the causes of deaths of lambs during the past year. What changes in the handling of the flock might have prevented some of these deaths?
4. Are lambs from this flock sold as docked ewe and wether lambs? If not, why? Find out if this has any bearing on the price received.
5. How and at what time are the sheep shorn? What prices have been received for the wool sold in recent years?
6. Weigh the fleece of each member of the flock as it is shorn.
7. If a grading report was obtained on previous sales, study it to learn the class and grade of the bulk of the fleeces from a previous shearing, and then try grading the fleeces.
8. Examine the fleeces carefully and list the criticisms you make of them.
9. Examine your sheep carefully for ticks and lice. Study the life history of these parasites and make plans for their eradication.
10. What indications are there of internal parasites in the flock? Plan for their treatment and prevention.
11. If western lambs are not fed on your own farm, visit the farm of a lamb feeder and list the important features of management.
12. What items of expense in addition to feed are involved in handling a flock of sheep? Determine the amounts of each of them as accurately as possible.

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Note. See also the reference in Chapter XIII.

CHAPTER XVIII

MANAGING SWINE

Success with swine depends largely upon the individual in charge of the enterprise. In the next few pages are discussed some of the management factors that are essential to success. Fully as important as definite plans to meet these requirements is the ability of the operator and his willingness to give to the individuals of his herd the necessary care when it is most needed and to meet and master emergencies as they arise.

Management Problems:

1. Choosing a farrowing date.
2. Managing the breeding herd to produce large litters of strong pigs.
3. Managing sows and litters to prevent losses.
4. Managing pigs after weaning.

1. Choosing a Farrowing Date.—Probably two-thirds to three-fourths of all pigs raised in the United States are farrowed in the spring, though many farms raise both spring and fall pigs. When two litters a year are raised from the same sows, it is very desirable that the spring pigs be farrowed not later than early March in order that the fall pigs can be given a good start before cold weather sets in.

The date a spring pig is farrowed is an important factor in the profit he will be able to realize for his owner. The net values of two pigs that make equal gains on the same amount and kind of feed may differ by $6 to $10 merely because one was farrowed in March and the other in June. This difference

is the result of variations in market price of hogs. A 200-pound hog sold in Chicago the second week in September, 1928, would have brought $25.82, whereas a similar animal sold the second week in December of the same year would have returned only $17.06.

Choosing the most profitable birthday for our pigs is difficult since it is not possible to predict accurately what the

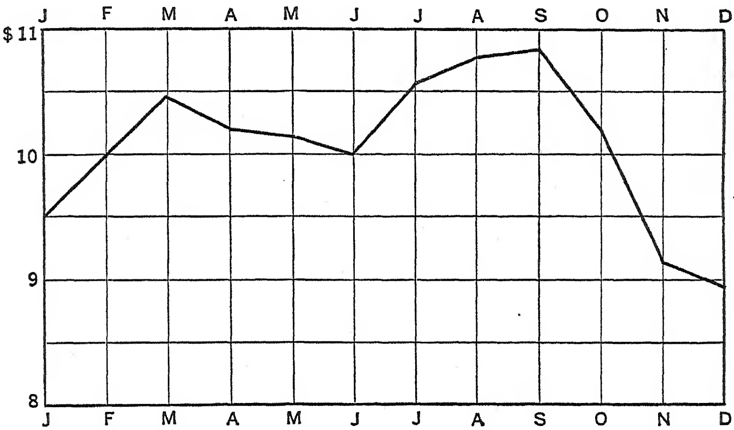


Fig. 94.—Average Monthly Prices of 200- to 250-pound Hogs on the Chicago Market during the 10 Years 1921–1930.

Pigs farrowed before April 1, if properly cared for, can be marketed at these weights when the price is usually highest.

market price of hogs will be on any future date. A study of hog prices over a long period reveals rather regular price movements at certain seasons of the year. In Fig. 94 there is given a curve of average monthly prices of 200- to 250-pound hogs on the Chicago market during the ten years 1921 to 1930, inclusive. From this it is seen that the prices during August and September are on the average higher than at other times, and that the lowest prices usually occur during December. March usually brings a secondary peak in the price of hogs of this

weight. So long as this condition exists one can plan to put his hogs on the market during the months of highest prices and avoid the months of low prices. One of the principal reasons for the peak prices is the fact that fewer hogs are sold at these times. If enough producers should attempt to take advantage of these periods of high prices, the supply of hogs on the market, of course, would become great enough to depress the price.

In addition to the probable selling price there are other factors to consider in deciding upon a date to have pigs farrowed. More labor and more and better equipment are required to care for sows that farrow in the cold weather of February and early March than are necessary in warm weather. Also, death losses among early farrowed pigs are higher than among those farrowed under more favorable conditions.

Although early farrowing requires more labor than late, labor is worth less in February and March on the average hog farm than it is in April and May. The total labor cost, therefore, may not be greatly different in the two cases. Of the two practices late farrowing is much the more popular.

The time of farrowing should be studied carefully in its relation to other enterprises of the farm as well as to its demand for labor and equipment and the time the pigs may be marketed. For example, if pigs are desired to "hog-down" corn or to follow cattle their farrowing date should be planned with reference to this need.

2. Managing the Breeding Herd to Produce Large Litters of Strong Pigs.—Large litters are important since they reduce the cost of producing pork. The cost of carrying the brood sow must be borne by the pigs she raises. The cost is not proportional to the number of pigs raised, but is about constant regardless of the size of her litters. If it is shared by 9 pigs, the initial charge against each is much smaller than if there are only 4 pigs to share it. In an Illinois study it was found that pork produced by pigs from litters of 6 to 8 pigs cost $7.60 per hundred pounds, while litters of 2 to 4 pigs raised that cost to $9.07.

Procedure:

(*a*) Breed only healthy, normal animals.
(*b*) Flush the sows.
(*c*) Give pregnant sows exercise and a balanced ration.
(*d*) Provide suitable shelter.

(*a*) *Breed only Healthy, Normal Animals.*—Relatively few healthy animals fail to produce young if given the opportunity. A grossly improper ration, however, or an extreme state of under-nutrition may take away this power temporarily. With advancing age, also, animals may lose their capacity to reproduce, but usually they have ceased to be of value in the breeding herd for other reasons long before this condition is reached. Excessive use of a boar may make him sterile temporarily or may even shorten his breeding life. Excessive fatness in breeding animals is undesirable at all times.

Disease, more often than anything else, is the cause of breeding troubles. Any acute disease may interfere with breeding or even endanger the life of the litter during gestation. Contagious abortion is most to be feared. It does not make the animal sick, but may frequently be the cause of sows failing to settle when bred or of pregnant sows losing their litters. Competent veterinary attention should be given to any herd that is suspected of having this infection.

(*b*) *Flush the Sows.*—Sows that are gaining in weight rapidly for several days before they are bred are thought to settle more readily and produce larger litters of pigs. For this reason the ration fed shortly before and during the breeding season should be liberal in amount and balanced. Such feeding is known as "flushing" the sows. Good pasture is especially desirable at this time.

Flushing is difficult to accomplish with sows that are bred as soon as they wean a litter. Since their udders have not yet ceased to function, liberal feeding is apt to stimulate milk production to the point of injuring the udders. Frequently sows that are fed heavily during the latter part of lactation can be

bred before the pigs are weaned and in this way the difficulty is overcome.

(*c*) *Give Pregnant Sows Exercise and a Balanced Ration.*—Experienced swine breeders are strongly of the opinion that the vigor of pigs at birth is largely dependent upon the amount of exercise the sow takes during gestation. If sows are given the run of a pasture or stalk field they will usually take sufficient exercise. Old and over-fat sows, however, and those confined to small quarters may need to be forced to take sufficient exercise. Often this can be done by feeding them some distance from their sleeping quarters. Providing a rack of alfalfa hay or scattering oats thinly over a clean feeding floor also gives them exercise.

The object to be sought in feeding pregnant sows is to put them in condition by farrowing time to produce a heavy flow of milk. If this is accomplished the feed requirements of both the sow and the unborn litter will be met.

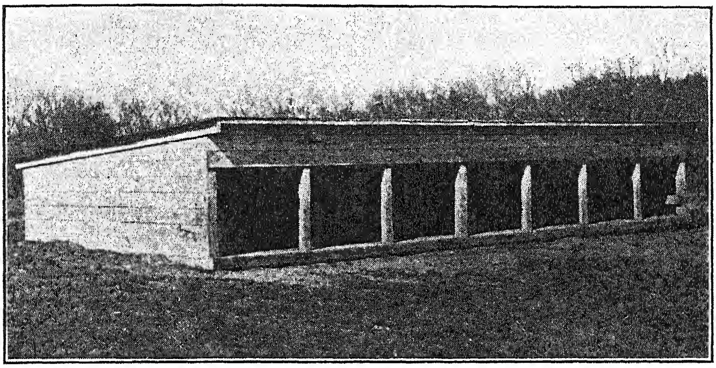
Maintaining a sow in an over-fat condition during gestation not only wastes feed, but also makes her lazy and awkward, so that when her pigs are born she is likely to crush a number of them by her carelessness. On the other hand, a poorly nourished sow cannot as a rule produce sufficient milk for her litter. For a discussion of the feed requirements and the methods of feeding brood sows during gestation, see Chapter XII.

(*d*) *Provide Suitable Shelter.*—Shelter for brood sows need not be elaborate or expensive. In winter in most climates where swine are grown extensively, they need only to be protected from severe storms and to have sleeping quarters that are kept dry and well bedded and are free from drafts. Sufficient room should be allowed to discourage the sows from piling up on cold nights; otherwise those that have been on the bottom get so warm that when they come out into the cold air they are apt to chill and may even contract pneumonia.

Many types of shelter can be used very satisfactorily. A deep, low shed with an open front facing away from the direction of the prevailing wind is excellent yet inexpensive protection.

It should be low enough, else be boarded down in front far enough, to prevent the wind and snow from whipping under. It need not be floored if it is kept well bedded and is on ground that is high enough so that water will drain away from it.

If natural shade is available, sows need no other protection during warm weather. If this is not available, artificial shade allowing a good circulation of air underneath it is necessary if loss from heat is to be avoided. A brush shade has the advantage of letting the rain through to settle the dust.



Courtesy of University of Illinois

FIG. 95.—A WINTER SHELTER FOR BROOD SOWS

A deep, low shed open to the south is usually the only shelter brood sows need during the winter.

Brood sows, especially during the latter half of gestation, should be given quarters by themselves in order that their ration may be properly controlled. Danger of accident is also less if the sows are not running with other animals.

3. Managing Sows and Litters to Prevent Losses.—Death losses of pigs between birth and weaning are one of the heaviest drains on the industry. Extensive studies have shown that while these losses vary widely from farm to farm, the average is not far from 35 per cent of all pigs farrowed. When it is realized that each pig at birth represents a cost equal to that of

approximately 140 pounds of feed, the immensity of such a loss and the necessity of reducing it are better appreciated.

Procedure:

(*a*) Put the sows in condition to farrow.
(*b*) Provide suitable shelter.
(*c*) Keep the farrowing pen clean.
(*d*) Prevent anemia in the pigs.
(*e*) Feed the sows to produce milk.
(*f*) Creep-feed the pigs.
(*g*) Vaccinate, castrate, and wean the pigs.
(*h*) Cull the sows.

(*a*) *Put the Sows in Condition to Farrow.*—By giving the sows suitable feed and exercise during gestation the number of pigs born dead or in a very weakened condition, the number starved, and the number eaten by the sows can be reduced. The number of pigs lost in these four ways amounts to about 9 of every 100 farrowed. Over-fat sows are sluggish and mash more of their pigs than active sows do. Since more pigs are lost from this cause than from any other, the condition of the sow should be watched carefully. Sows that have been fed an unbalanced ration are more likely to eat their pigs than are well-nourished sows. About 2 pigs of each 100 born meet this fate.

Insufficient milk, of course, handicaps a pig, while too much milk during early life may bring trouble from scours. The sows should be fed to avoid both these extremes.

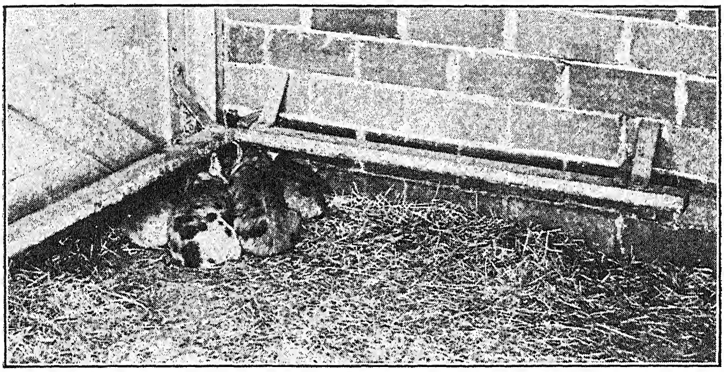
Heavy milking sows with small litters are sometimes subject to milk fever. This can usually be prevented by limiting the ration of such sows for a week after they farrow.

Rations for brood sows and methods of feeding are discussed on page 234.

(*b*) *Provide Suitable Shelter.*—Since fully 70 per cent of the pigs that die between birth and weaning die during the first few days in the farrowing pen, it is imperative that the pen be made as safe as possible. The two most important causes of

death of new-born pigs for which the quarters are to some extent responsible are, being mashed by the sow and being chilled. About 15 pigs of every 100 farrowed are mashed by the sow, while nearly 3 of each 100 farrowed die from exposure. Both these losses are higher in cold than in warm weather.

The number of pigs mashed can be greatly reduced by equipping each pen with guard rails in the corner where the bed is made. (See Fig. 96.) The rail holds the sow away from the wall when she lies down. The pigs that otherwise might



Courtesy of University of Illinois

FIG. 96.—A PIG FENDER

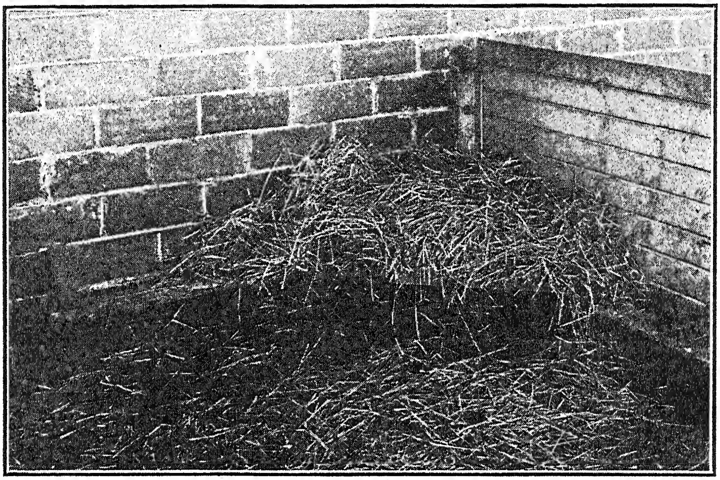
A guard rail in the corner of the pen where the bed is made will save many little pigs from being crushed by the sow.

be trapped between the sow and the wall can thus escape under the rail and avoid being mashed. The vigilance of the careful herdsman, however, is even more important than guard rails in saving pigs.

Farrowing quarters, whether in a central hog house or in individual movable houses, should be tight enough to prevent cold drafts blowing through them and they should be kept dry.

In extremely cold weather pigs can be saved by drying them off as soon as they are farrowed and putting them in a bushel measure which contains a jug of hot water covered with

fine straw or old rags. After all the pigs are born, they are returned to their mother and permitted to nurse. It may even be advisable to keep them in the warm basket, or in a barrel similarly prepared, for 12 to 24 hours, depending upon conditions. In this event, they should be allowed to nurse every three hours. A pig nest in the corner of the pen is enjoyed by young pigs during very cold weather. (See Fig. 97.)



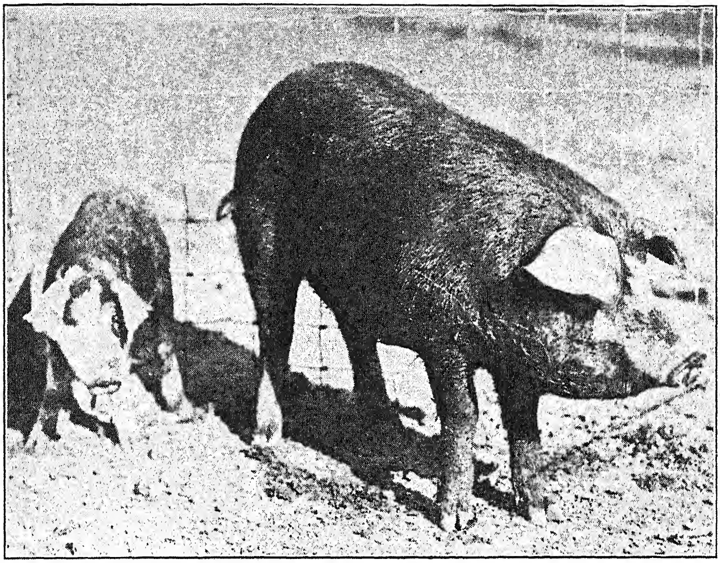
Courtesy of University of Illinois

FIG. 97.—A PIG NEST

Because of the comfort such a nest affords young pigs in cold weather, they will do most of their sleeping in it. This reduces the danger of their being crushed by the sow.

Bedding should be renewed often enough to insure a dry bed at all times if pneumonia and other pig ailments are to be avoided. Damp beds in cold weather frequently result in little pigs losing their tails. A ring forms around the tail and the tail dies and sloughs off. This can be prevented if treated early by greasing the tail well with vaseline. Large amounts of bedding should never be used because of the danger of pigs burrowing in and becoming lost from the view of the sow.

(c) *Keep the Farrowing Pen Clean.*—Many pigs die or become permanently runty because of being exposed to parasites and filth-borne infections in the farrowing pen. All the losses due to necrotic infection, sore mouth, worms, and related troubles can be almost completely prevented by sanitation. Enforcing sanitation has often so reduced the cost of production



Courtesy of University of Illinois

FIG. 98.—WHAT OLD HOG LOTS DO TO YOUNG PIGS

These pigs are the same age. The runt while young found a hole in the fence and repeatedly visited the old hog lots, each time returning to the clean pasture. The other pig never found the hole.

that satisfactory profits have been realized where only losses had occurred without sanitation.

In preparing a pen for a sow and litter, all the bedding and manure should be removed as completely as possible with pitchfork, shovel, and broom. The pen floor and lower walls should then be scalded with a boiling lye solution (1 pound of

lye to each 35 gallons of water). The hot water should be used liberally, since it is the heat that kills any worm eggs that may be present. After the pen is dry, clean straw is put in and the pen sprayed with any good disinfectant.

Before the sow is put into the clean pen to farrow she should be washed with warm water and soap to remove any dirt that might harbor worm eggs.

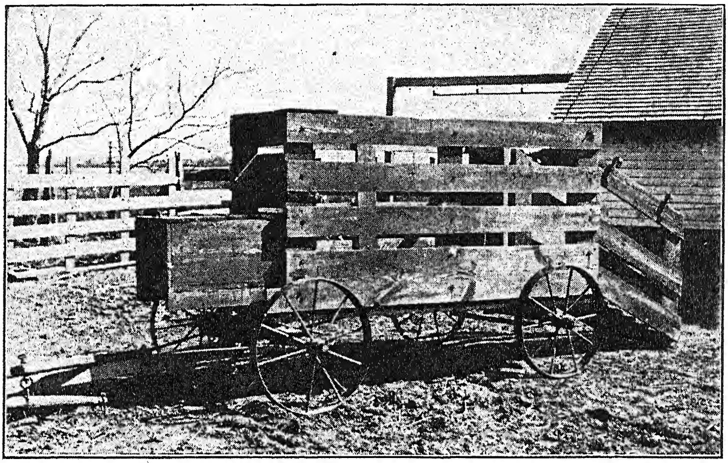


Photo by R. J. Laible

FIG. 99.—AN AID TO HEALTHY PIGS

One of the difficult features of swine sanitation is made easy on the farm of Lowell Kraft, McLean Co., Ill., by this piece of home-made equipment. The sow rides in the main rack while the little pigs are put in the box in front. The end of the rack forms the bottom of the loading chute. The sides of the chute are removable and are carried on the sides of the rack.

To complete the sanitation program, the sow and pigs should be hauled, not driven, to pasture, and the pasture should be one that has had no hogs on it for at least a year and has been cultivated in the meantime. If the pigs are confined to clean ground until they are four months old, they develop a resistance to worms.

No practice that can be applied on the average swine farm will return as much as swine sanitation in reduced death losses and increased rate and economy of gain.

(*d*) *Prevent Anemia in the Pigs.*—Pigs that are restricted to their mothers' milk develop anemia within three to five weeks after birth. This condition is identified by a decline in the number of red cells and the amount of hemoglobin in the blood. Anemic pigs show a paleness of skin (except where this is masked by black pigment), especially about the ears and the end of the nose. In advanced stages of anemia the pigs develop a drawn expression about the forehead and eyes and a thickened, edematous (watery), wrinkled condition of the skin about the neck and shoulders; they become listless and inactive, thus increasing the danger of their being mashed; they frequently develop thumps, and may ultimately die. Characteristic internal lesions also develop. Especially noticeable among these are paleness of the membranes, a greatly enlarged heart, and lesions in the liver.

From a practical standpoint the malady is primarily troublesome with pigs that are farrowed during cold weather and are kept inside for protection. The consumption of almost any natural feed other than milk, likewise the opportunity to root in the soil, will apparently prevent anemia developing to a dangerous degree or will stimulate recovery if the condition has not developed too far. Anemia may become dangerous, however, before the pig begins to eat solid feed. Exercise is apparently not a factor either in protection or cure.

This nutritional type of anemia has been shown definitely to be due to a deficiency of iron in the milk of the sow. Lack of copper may also be a factor. Because the malady is due to a shortage of these necessary elements, it is not surprising that the fattest, most growthy pigs may be troubled first, since rapid growth naturally increases the rate at which these blood-forming constituents are used in the body of the little pig beyond the meager supply of these elements in the milk.

This milk anemia can be prevented by making it possible

for the pigs to get additional iron or iron and copper before they begin eating solid feed. Pigs that have the run of pasture during this time or that have the opportunity to root in the soil apparently do not develop anemia to any marked extent. For pigs that cannot be handled in this way a simple and cheap, yet effective, method of preventing anemia has been worked out at the Illinois Station. From this work it seems quite evident that under practical conditions milk anemia can be prevented by applying to the udder of the sow a solution that contains some iron compound. Such a solution can be made by dissolving 20 ounces of copperas (ferrous sulfate) in 2 quarts of water. After the copperas is dissolved, 2 quarts of any ordinary syrup are added to make the mixture adhere to the udder. The solution is applied to the udder of the sow with a clean brush once a day during the time the litter remains in the barn or until the pigs begin to eat solid food. The treatment is positive, since the pigs cannot nurse without getting the iron.

Death losses among treated pigs in the Illinois study were very low—only 1 of 35 treated pigs was lost between the ages of 8 days and 8 weeks, while 24 of 60 untreated pigs died during the same interval, a loss of 40 per cent.

Several investigators have shown definitely that the malady cannot be avoided by feeding the sow the necessary elements.

(*e*) *Feed the Sow to Produce Milk.*—A pig that at birth may weigh 2½ to 3 pounds, may weigh double this when a week old. Such rapid growth is possible only if an abundance of good feed is available. Since a pound of gain made by the suckling pig requires less feed than an equal gain requires at any future time, it is poor policy not to feed the young pig liberally. During the early days of a pig's life, this can be accomplished only by stimulating a full flow of milk in the sow. How to accomplish this is outlined in Chapter XII.

(*f*) *Creep-feed the Pigs.*—By the time a pig is three weeks old he shows an interest in solid feed. There are three reasons for giving nursing pigs a good ration in addition to their mothers' milk: (1) to increase the rate and reduce the cost of

their gains; (2) to keep them thrifty so that they will be less susceptible to parasites; and (3) to make it possible to wean them without checking their gains. As the sow's milk flow declines the pigs naturally look to the dry ration for an increasing proportion of their total feed until when weaned they scarcely miss their mothers.

This additional feed can be supplied most satisfactorily in a pig creep—an inclosure in the corner of the pasture or yard to which the pigs have access but from which the sows are excluded. The feeds may be offered in troughs, always kept clean, or even better in self-feeders. The feed requirements of pigs and successful methods of feeding them are discussed in Chapter XII.

(*g*) *Vaccinate, Castrate, and Wean the Pigs.*—The risk of loss from hog cholera is so great in swine-growing sections that one can hardly afford not to immunize his animals against it. Investigations in recent years have demonstrated the feasibility of immunizing baby pigs. Small pigs require less serum and virus than larger ones, which is an item of economy, and they are much more easily handled than the heavier animals. Also, they are usually thriftier when about a month old than they are just after they are weaned. Many hog men now follow with entire success the practice of vaccinating their pigs when they are about a month old, which justifies the conclusion that the immunity when once established is lasting.

It is customary to castrate boar pigs a week or ten days before they are vaccinated, or wait until about a month after. The shock of castration is apparently less with the younger pigs.

Pigs can be weaned safely when they are eight weeks old in case it is desired to breed the sow at once for another litter; otherwise they are allowed to run with their dams two to four weeks longer. If they have become accustomed to a suitable ration before this time they receive no setback when their mothers are taken away. (See page 237.)

(*h*) *Cull the Sows.*—The number, size, and quality of pigs

weaned bear a close relationship to the profits of pork production. An excellent check on the productivity of sows can be made at weaning time. Mature sows that do not wean at least seven good pigs, and gilts that wean fewer than six, unless some accident is known to have been the cause, should yield their places in the herd to animals that will meet these standards.

The discarded sows should be given a full feed of a well-balanced ration and marketed as soon as they are fat enough and their udders have smoothed up.

4. Managing Pigs after Weaning.—Pigs that have been handled as suggested in the foregoing paragraphs and that are normal and healthy at weaning require very little special attention to make of them profitable market hogs.

Considerations:

(*a*) Feeding to produce rapid gain.
(*b*) Selling the pigs when they are finished.

(*a*) *Feeding to Produce Rapid Gain.*—From 80 to 90 per cent of the cost of making pork after weaning is represented by feed. How to feed weaned pigs for most economical production, therefore, is the major consideration at this stage. Rations and methods of feeding are discussed in Chapter XII.

Another matter that merits careful thought, especially with early spring pigs, is the fact that the method of feeding will largely determine the time the pigs will be ready for market, and this is of primary importance in view of the fact that market prices, as previously discussed and as shown in Fig. 94, are almost certain to be definitely higher during the early fall months than later.

Pigs that are farrowed before April 1 can easily be made ready for the September market if they are kept free from parasites and disease and are fed suitable rations.

There is little to justify the procedure, now so common, of feeding early spring pigs a light ration on pasture. Farrowing losses are higher among early pigs than among those farrowed

in warmer weather, and the labor and equipment charges at farrowing time are somewhat greater as well. After this loss has been sustained, it seems poor policy to handle the pigs in such manner that they must sell at a low price. The defense usually made for such a practice is that the pigs are finished on new corn, which is cheaper than old-crop corn. A study of these price relationships reveals that never during the last ten years, and supposedly longer, has the price of new corn been enough below the price of old to offset the decline in hog prices between September and December. September hog prices in Chicago during this period have varied between \$8.46 and \$13.51, with an average of \$10.85, while December hogs have sold for \$6.97 to \$11.63, averaging \$8.93. The average price of corn for October, November, and December over the same period has never been over 20 cents a bushel higher than the average price during June, July, and August. During two of the years new corn was actually worth more than old. On the average, however, it was 9 cents cheaper.

This difference in corn price would represent a saving of 75 to 90 cents per head. The average difference in prices of hogs (see above) is \$1.92 a hundred, or \$4.32 on a 225-pound animal, which suggests a net loss on the prices of that period of approximately \$3.45 a head by feeding early spring pigs a light ration during the summer with the idea of finishing them on new corn. There are several factors involved in this comparison other than those mentioned, but they are largely in favor of the full-feeding method. Market prices do not fluctuate as much during the market period for fall pigs as for spring pigs. Even fall pigs, however, should not spend much longer than 6 or 7 months on the farm.

If pigs are wanted to "hog-down" corn or to follow cattle, sows should be bred to raise them especially for such purposes. In doing this, advantage should be taken of warm months for farrowing and of forage crops whenever possible.

Shelter and other equipment for fattening pigs may be very simple. Shade during the summer and a dry bed during the

winter are the chief requirements in addition to feed. A good watering device that will supply plenty of clean water in summer and water without ice in winter will be found to pay. The feed and water should always be close together, especially if self-feeders are being used.

Both fattening hogs and breeding animals should be kept free from lice and mange. An occasional spraying with crude oil or waste oil from an automobile crank case will usually accomplish this.

(b) *Selling the Pigs When They Are Finished.*—The weight at which to sell pigs will depend on several factors, among which may be mentioned: (1) how well they are finished at a light weight; (2) the amount of feed available and the ratio of its price to the price of hogs; and (3) the probable trend of the hog market.

In order for pigs to sell well on the market they must be finished to the point that they will yield a high percentage of carcass of satisfactory quality. Extremely rangy pigs and pigs that have been grown on a moderate ration rather than full-fed may lack finish by the time they weigh 200 to 225 pounds. Lack of finish results in a soft carcass and a belly cut that is too thin to produce first-grade bacon. The carcasses of over-fat hogs, on the other hand, carry an excessive amount of lard, which in recent years is worth little, and bacon cuts that are much too thick for best quality.

In view of the fact that the market in recent years is unable to utilize heavy hogs in large numbers, some caution should be exercised in producing them. This is especially true since each additional pound of gain is put on at the expense of more feed than the pound before it. Experiments show, for example, that to feed 100-pound pigs to a weight of 150 pounds requires very close to 3½ pounds of a well-balanced ration for each pound of gain, while an average pound of gain between the weights of 300 and 350 pounds requires a little over 4½ pounds of feed, an increase of 30 per cent.

If the price of hogs is relatively higher than the price of

feed it may at times be profitable to carry pigs to heavy weights even though this is done at the expense of additional feed for each pound of gain. A more profitable procedure, when it is possible, would be to sell the pigs as they reach desirable market weights and replace them with lighter pigs. Suitable light pigs, however, are not always available.

In face of relatively high feed prices, on the other hand, hogs should never be made so heavy that the market penalizes them because of weight, unless it is advancing at such a rate that heavy hogs later will actually be worth more per pound than light hogs are at the earlier date. This condition seldom exists and even when it does one can never be certain that the price of heavy hogs 30 or 60 days hence will be higher than the price of light hogs at a given time.

The logical procedure, therefore, seems to be to attempt to have the pigs well finished at a weight that is not penalized by the market and to sell them when they reach that weight. At the present time the market can apparently utilize more hogs between weights of 200 and 225 pounds than heavier or lighter animals.

FARM STUDY

1. Make a study of the dates of sale of the fat hogs from your farm as far back as dates, sale prices, and weights are available.

   (*a*) How much over six months old were the hogs when sold?
   (*b*) If more than six months, did they weigh enough over 200 pounds to justify this greater age?
   (*c*) After studying this chapter, what changes in the feeding and management do you think might have been made so that the pigs could have been marketed when prices were higher?

2. During the last farrowing season on your farm, what was the average number of pigs raised to weaning per sow farrowing?

   (*a*) How much feed was lost on your farm during last farrowing season by pigs that did not live to be weaned?
   (*b*) What was the cause of death of the greatest number of pigs?
   (*c*) After your study of this chapter, what do you think might be done to decrease these losses?

(*d*) During next farrowing season on your farm, make a careful record of the extent and cause of loss of pigs between birth and weaning with a view to reducing this loss.

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CHAPTER XIX

MARKETING LIVESTOCK

The marketing of livestock, in a broad sense, may be looked upon as including all those processes involved in getting the animals from the regions where they are produced, converting them into salable form, and disposing of them to the ultimate consumers. For the purpose of this discussion, however, marketing will be limited to methods of selling farm animals and their products either locally or on the large central markets.

Most animals are marketed for slaughter. In 1931 there were slaughtered under federal supervision in the United States 8,108,000 cattle (exclusive of calves), 44,772,000 swine, and 18,071,000 sheep and lambs. In addition to the animals marketed for slaughter many are sold for further use on other farms. This is especially the case with horses and many dairy cattle, and of the breeding and feeding classes of beef cattle, sheep, and swine. Purebred animals are generally marketed in this way although they may be marketed for slaughter when no longer needed or useful for breeding purposes.

MARKETING MEAT ANIMALS

Numerous factors are involved in the marketing of meat animals.

Management Problems:

1. Choosing a market.
2. Selecting a method of marketing.
3. Selecting a method of transportation.
4. Determining marketing costs.
5. Deciding on time of marketing.
6. Preparing animals for market.

1. Choosing a Market.—Almost every livestock producer nas the privilege of choosing a market. Usually his choice will be one of the central markets. A producer in central Illinois, for example, would have the choice of consigning his stock to Chicago, St. Louis, Peoria, Indianapolis, or other nearby markets. The particular market he selects will depend largely on the net receipts which he expects to get, after taking into consideration the prices being paid at the various markets, the

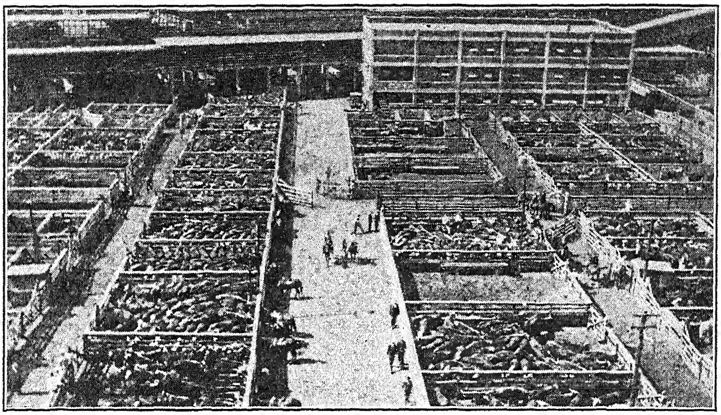

Fig. 100.—A Central Livestock Market

Arrangements similar to those shown for cattle are provided for handling hogs and sheep.

probable shrinkage in shipment, freight rates, etc. If he thinks his shipment will bring more at Indianapolis than at any other market, that is where he will ship.

The producer may prefer to sell on a local market rather than on a central market. If he believes that his net return will be as great if he sells at home as if he ships to a central market, he will probably choose the former because of less risk of price changes and of shipping losses.

2. Selecting a Method of Marketing.—Livestock which is to be shipped to a central market may be consigned either by

individuals or by an organization. Formerly the producer who had less than a carload of stock was handicapped if he wished to ship to a central market. Among other difficulties, freight rates have always been extremely high on less-than-carload lots. To overcome these disadvantages of individual shippers, livestock shipping associations have been organized. As a further aid to the producer, there are on the larger markets cooperative selling associations, to which the livestock may be consigned by the individual or by the local shipping association. The establishment of these cooperative selling agencies has given to the producer the ownership of his marketing associations, control of operations, and a larger voice in the sale of his livestock. One of the important advantages of local shipping and central-market selling associations is the fact that they bring to their members information concerning prevailing market demands, seasonal price cycles, and proper preparation of animals for shipment so as to minimize injury and shrinkage in transit. Private commercial sales agencies, commonly known as commission companies, are also found on all markets and many shipments of livestock are handled by them.

The following outline will give some idea of the steps in marketing a cooperative shipment of livestock. Of course not all cooperative associations follow this procedure closely.

The cooperative shipping association—

(*a*) receives the stock;
(*b*) marks that belonging to each shipper;
(*c*) weighs each consignment;
(*d*) grades the animals;
(*e*) orders cars;
(*f*) loads the stock;
(*g*) bills it to selling agency at market;
(*h*) insures its safe delivery.

This completes the activities of the shipping association until the returns are received. The transportation agency then takes charge and—

(*a*) inspects and seals the car;
(*b*) transports the car to the central market;
(*c*) unloads the animals for feeding, watering, and rest in transit.

Laws require that stock be unloaded at the end of each 28 hours it is in transit. This time is sometimes extended to 36 hours if a "release" to that effect has been signed by the shipper. At least 5 hours must elapse before stock can be reloaded.

When the stock arrives at the market it is received by the stockyards company. This company—

(*a*) unloads and counts the animals;
(*b*) places them in pens or yards;
(*c*) supplies feed and water.

The shipment is then placed in charge of the selling agency to which it was consigned for sale. As mentioned, this may be a cooperative commission association or a privately operated agency.

The selling agency is organized to—

(*a*) receive the animals;
(*b*) grade and sort them;
(*c*) sell to the highest bidder;
(*d*) collect from the purchaser;
(*e*) pay freight and other expenses;
(*f*) render accounts to the consignor;
(*g*) organize and disseminate market information.

After the shipment of animals has been sold, it is weighed under the supervision of government agents. The stockyards company then counts the animals and yards them for the purchaser or reloads them for shipment if sold to someone outside the market.

Since the shipment being considered is a cooperative one, the local shipping association will then

(*a*) receive the returns;
(*b*) prorate the returns to each shipper;
(*c*) pay the consignors;
(*d*) supply information to each consignor.

3. Selecting a Method of Transportation.—For most large shipments of livestock, railway transportation is used. However, trucks have become increasingly important in hauling stock from farms to market and also in hauling feeding animals

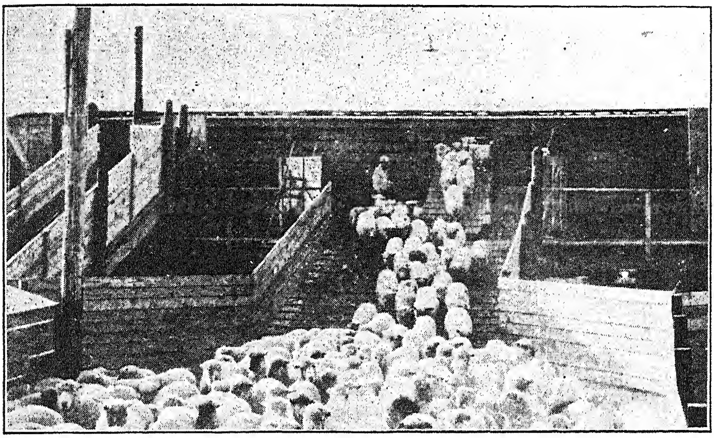

FIG. 101.—EN ROUTE TO MARKET

These lambs are being unloaded from a double-deck car to be fed, watered, and rested, and then reloaded.

from the markets to farm feed lots. The shipper's location, distance from market, relative convenience, and relative costs are among the chief considerations determining which method of transportation is preferable.

4. Determining Marketing Costs.—There are four items which make up marketing expense—freight or other transportation charges, yardage, feed, and commission. These costs, excepting that for feed, may be known in advance. Freight

rates are assessed on the basis of kind of livestock, weight, and distance transported. Stock cars are single-deck and double-deck, and are 36 and 40 feet in length. For each of these there are prescribed minimum weights for each kind of stock. If a car is not loaded to exceed its minimum load weight, the freight charge is based on this weight; if it does exceed the minimum weight, the charge is based on the actual weight. For shipment from one state to another (interstate) the minimum weights are the same for the entire country, although there is some variation within states. The following table shows the present interstate minimum weights:

TABLE 12

INTERSTATE MINIMUM WEIGHTS OF LIVESTOCK SHIPMENTS

Kind of Stock	For 36-Ft. Car		For 40-Ft. Car	
	Single-deck	Double-deck	Single-deck	Double-deck
	Pounds	*Pounds*	*Pounds*	*Pounds*
Cattle	22,000	....	24,000	....
Calves	16,000	24,000	17,000	25,000
Hogs	17,000	23,000	18,000	24,000
Sheep	12,000	18,000	13,000	19,000

In loading cars it is advisable to avoid overcrowding even though the minimum weight may not be reached. The accompanying table shows the number of animals which may be safely loaded in a single-deck car.

Yardage charges are assessed at so much per head on all shipments. These rates vary with the market.

Feed given to the animals at the yards is charged at prices set by the stockyard company. These prices vary widely on the different markets and at different seasons.

TABLE 13

NUMBER OF ANIMALS WHICH MAY BE SHIPPED SAFELY IN A SINGLE-DECK CAR *

Kind of Stock	Average Weight of Animals	Length of Car	
		36 Ft.	40 Ft.
	Pounds	*Number of Animals*	*Number of Animals*
Cattle	400	50	56
	600	37	40
	800	30	33
	1,000	25	27
	1,200	22	23
Hogs	175	89	98
	200	79	88
	250	68	76
	350	53	59
Lambs	60	150	160
	75	125	140
	100	105	115
	125	95	105

* Based on recommendations of the Ohio Livestock Cooperative Association.

Note: In loading lambs and hogs in double-deck, the number in the upper deck should be eight to ten fewer than in the lower deck.

The freight rate charged varies with the kind of livestock.

Commission charges tend to be uniform for all companies operating on a given market, but on some markets the largest cooperative firms operate on a lower commission rate basis. These charges are regulated by the Federal Packer and Stockyards Administration. If animals are brought to market in trucks, or if the stock in a carlot shipment belongs to more than one man, the commission charge is made on a per-head

basis. On full carloads belonging to one shipper the commission is charged on a car basis.

5. Deciding on Time of Marketing.—There is an old saying to the effect that the best time to market livestock is when it is ready; meaning when it has attained the desired weight and condition. However, it is possible to control this time by being careful to have the animals born at certain seasons or to buy feeding animals of certain weights or at certain periods. Market prices, of course, do not follow an exact and definite path, but there are certain rather distinct tendencies shown. For example, most lambs are born in the spring of the year and most of them are not marketed before they are six months of age. This means that the number of lambs on the market is likely to be larger in the fall of the year than in the spring and therefore the price of lambs is apt to be lower at that time. Hence there is a possibility for some producers to plan lambing time in their flocks so as to be able to sell their lambs when the price is apt to be most favorable. Similar situations exist in the case of hogs and cattle. The general tendencies for swine prices may be seen in Fig. 94. Prices for choice fed cattle are generally most favorable to the producer during late summer and fall. Prices for feeder cattle are highest during the spring and early summer. The quality of the animals marketed varies considerably from season to season. For a given grade of animals the price is usually highest when the numbers on the market are smallest.

6. Preparing Animals for Market.—In general, the best way to prepare livestock for market is to follow the most desirable practices in feeding and management throughout the period of production.

To ship well, animals ought not be heavily fed just before loading. All cars should be properly bedded. Sand is very suitable for cattle and hogs but should not be used for sheep because it gets into the wool. In summer the sand may be sprinkled with water. Straw is satisfactory but should never be wet.

MARKETING PUREBRED LIVESTOCK

Methods of selling purebred livestock differ greatly from methods of selling animals intended for slaughter. For success in this field special talents are required.

Management Problems:

1. Advertising.
2. Corresponding.
3. Displaying animals.
4. Pricing animals.
5. Shipping animals.

1. Advertising.—Advertising may be done in various ways. Farm magazines and newspapers are good mediums for this purpose if carefully selected. Printed catalogs are useful, too, especially for auction sales, as a supplement to the other advertising. Exhibiting animals at fairs is excellent advertising if one is successful in winning many prizes. In preparing advertising matter, one should try to make a special appeal to the reader. Information about the animals should be convincing, accurate, and reasonably complete. Good pictures attract attention and are helpful in giving specific information. Animals offered for sale should never be misrepresented.

2. Corresponding.—Successful advertising will result in many inquiries. These should be answered promptly and completely. Attractive stationery and the ability to formulate an instructive and cordial reply are important sales aids. Letters should be kept for use in making up further mailing lists.

3. Displaying Animals.—When prospective purchasers call at the farm to see animals, every courtesy should be shown them. Care should be taken to have the animals in good condition and to display them to good advantage. The latter does not mean to attempt any deception but simply to show the animal at its best. It is a great advantage to have all animals well trained so that they may be handled readily.

4. Pricing Animals.—Purebred animals should be priced fairly. This means that the breeder must be a good judge of

animals and must have some idea of the prices asked and received by others. Animals of exceptional individuality which may be sold for show purposes will bring much better prices than the average purebred. However, the possibility of many such sales at high prices is not very great for the beginner or for the breeder who does not have a herd or flock of established reputation. It is generally a poor policy to price animals so high that few sales are made, as this will result in having to carry many animals over to the following year. Inferior individuals should be sold on the market for meat purposes.

5. Shipping Animals.—Purebred animals are often shipped as individuals or in small lots. When sent by freight such animals are shipped as less-than-carload lots. Some railroads handle them at reduced rates as compared with rates for market shipments.

Small animals, such as pigs, calves, and sheep, are often crated and shipped by express. Such shipments should be made in substantial crates of such size that the animals will be able to lie down. Sometimes purchasers do not care to keep the crates and are willing to return them "collect." This will aid in keeping costs for crates reasonable.

MARKETING DRAFT HORSES

Surplus work horses sell best at from five to nine years of age. Farmers who raise their own horses usually plan to sell them before they depreciate in price because of age. When a pair of colts is "ready for the collar," an older team is sold. In the disposal of horses, various methods may be considered.

Management Problems:

1. Selling at private sale.
2. Selling on a central market.
3. Shipping.

1. Selling at Private Sale.—Most horses change hands at private sale. It is seldom that the individual farmer ships

his surplus horses to a central horse market. The proper horsing of the farms in a community usually involves considerable selling between producers and users. Among the advantages of local buying and selling are the elimination of some of the disease hazards of the central markets. The most important of these is equine shipping fever, which is a rather frequent accompaniment of shipping and stabling in sales barns. The local buyer is frequently a factor both in bringing horses into the community and in selling the communities' surplus on other markets.

Farmer breeders in a community should cooperate at least to the extent of producing the same type and breed of draft horses. This effort for uniformity will give the community a good reputation with buyers. They appreciate the opportunity of filling their orders within a reasonable time. It will also result in the production of more matched teams, which practically always sell at an advance over the price paid for odd individuals. There is opportunity for much improvement in the general merit of work horses which are offered for sale on the average farm.

Selling at a good, profitable price is always facilitated by offering a useful horse in attractive condition, truthfully represented, and fairly priced. Horses old enough to work are very severely discriminated against in price unless they are thoroughly broken to work, and that means being able to back a load as well as pull it. The seller is severely penalizing himself in offering "green," unreliable horses for sale.

No amount of salesmanship will take the place of these fundamental requirements. Contrary to the mistaken ideas of a few, the success of the seller depends, in the long run, upon the confidence which the buyer has in his integrity and ability.

2. Selling on a Central Market.—Horses on the central markets are sold both privately and at auction. Many of the transactions are between professional dealers.

"The principal factors that determine the market value of horses and mules are: Soundness, conformation, quality,

condition, action, age, color, training, and general appearance."[1]

Horses and mules of similar type are grouped into classes. In most instances the names of the class suggest the job or use to which they are put.

The demand for work horses and mules is very seasonal. The bulk of the trade is in purchases for farm and plantation. Requirements are usually purchased within a few weeks of the time they will be put to use.

3. Shipping.—

Considerations:

(*a*) Transporting by truck.
(*b*) Transporting by rail.

(*a*) *Transporting by Truck.*—In recent years trucks have been very generally used for delivering horses within distances which might be covered in one day's driving. The equipment varies from the ordinary, well-built stock trucks to padded vans fully equipped for the comfort and safety of the horses. The use of such vans is mostly confined to the transporting of race and show horses.

(*b*) *Transporting by Rail.*

Express.—Valuable race, show, and breeding stock is frequently shipped by express in cars especially designed for this purpose. The adjustable partitions in these cars accommodate 12 to 16 head of horses. They are stalled four abreast, lengthwise of the car. Cross-tying is usually practiced. Dealers in commercial horses sometimes ship draft geldings loose in cars holding 28 head. The open construction of the upper part of the car permits plenty of ventilation.

Freight.—Ordinary work stock is frequently shipped loose in standard stock cars. These cars are satisfactory except during very severe weather.

[1] Ill. Agr. Exp. Sta. Bul. 122. Market Classes and Grades of Horses and Mules.—R. C. Obrecht. (Out of print.)

Palace cars may be used for more valuable horses. Such cars are leased for the trip, or for the season by showmen who are making a circuit of fairs.

Box cars in good repair are frequently used for shipping less than full carloads. Strongly constructed stalls may be built in lengthwise of the car. Where one or two horses are shipped, they are usually partitioned in the ends of the car and turned loose. This is the most frequent method of shipping purebred draft stallions and mares. Mature horses should be stalled by themselves. Unshod colts which are acquainted with one another may safely be turned together. Strong material, securely nailed in place, should be used for partitions; the lower cross pieces should be close enough together to prevent a horse's foot being caught. The door on the side away from the traffic should be cleated part way open for ventilation.

Feed, Water, and Care during Transit.—For short shipments by rail, plenty of good bedding is all that will be required.

For long distances, when horses are in the cars for several days, they are either fed and watered in transit or unloaded for this purpose at some stockyards. If a water barrel is used for horses being shipped loose in a car, it should be well secured in a corner. A heavy stick or two of wood should be floated on top of the water to lessen splashing. Flakes of baled hay, wired to the partitions, will last through a long journey. Horses thus equipped and unattended have safely traveled long distances by rail. On the bill of lading request should be made that attention be given to the water barrel and note should also be made of "feed, water, and room to lie down." Plenty of hay keeps the horses busy and helps to allay restlessness. Little or no grain should be fed in transit.

It is important that horses be fed moderately several days before shipping and that their bowels be in good shape before shipping. Use soft feed if necessary for this purpose. When horses are unloaded from a long journey on the cars, they should be brought up to full feed gradually.

MARKETING DAIRY CATTLE

As a rule, cattle from herds having good records of production are in much greater demand than those from herds having no records. Owners of grade herds may secure records through membership in dairy herd improvement associations or by keeping private records, as discussed in Chapter II. The former have more value from the advertising and sales standpoint. The breed associations conduct systems of advanced registry for recording and publishing the production records of registered cows and the records of progeny of proved sires.

Confidence of a purchaser is often lost through inaccuracies which crop out in breeding records. It is essential that all records, particularly those in a purebred herd, be carefully kept; also that they be up to date. A filing system for registration and transfer certificates and a book of herd records and pedigrees should be kept in the house or office. In addition to this, a concise record kept in a pocket notebook is a distinct asset for use when showing the herd to visitors and prospective purchasers.

Freedom of the herd from disease is a valuable advertising feature. If a herd is accredited as free from tuberculosis and abortion, not only are buyers attracted, but the owner of such a herd can ship cattle interstate without additional tests. Where possible, tests should also be made for Johne's disease, which is recognized in several states as a serious menace.

Animals which are to be inspected by prospective buyers should never be allowed to become coated with manure and mud. Frequent currying, the judicious use of bedding, and keeping buildings and lots free from filth, manure, and mud are necessary aids in keeping the animals and premises clean and attractive. Buildings should be kept in repair and well painted. The inside walls and ceilings of the barn must be kept free from cobwebs and filth. These may well be whitewashed once or twice a year. Neat, clean yards with fences or

fence posts painted, add greatly to the attractiveness of the premises.

It is seldom profitable in the long run to sell the best heifers or young cows in either grade or purebred herds, for if this is done, it is very difficult to increase production or even to maintain a high-class herd.

Surplus breeding stock in grade herds consists chiefly of cows, inasmuch as young animals are usually sold for veal. When the heifers from the best cows are raised, the older cows are thus disposed of before they pass the age of 6 or 7 years, which means that they remain in the herd during the years of maximum production and are sold before they decline much in production or sale value.

A very common plan of disposing of surplus purebred stock is to offer stock for sale at the farm throughout the year. While the direct expense is less than when stock is shipped to a consignment sale, the selling prices are also less as a rule.

In many localities cooperative breeders' associations employ a secretary to advertise the cattle, to correspond with prospective purchasers, and to conduct purchasers from farm to farm of the members. Such a plan is very effective because buyers are attracted to a locality where a number of herds of the same breed may be seen and where the breeders' association offers a stronger guarantee of fair dealing and of the health and quality of the cattle than can be given by a breeder working alone.

Consignment sales, that is, public sales to which the owner may consign his animals for sale, afford another means of disposing of surplus stock. The breeders of a community may find this an excellent method provided they seek to build a good reputation by offering only sound, high-class animals. Some of the drawbacks of this plan are that only a limited number of bulls find a ready market at such sales and the offering of high-class females tends to deplete the breeding herd. There is also considerable expense involved in proportion to returns when cattle prices are low.

MARKETING DAIRY PRODUCTS

Selling whole milk usually brings greater returns than selling cream for butter-making. Milk for city distribution as fluid milk returns more than milk sold to condensaries, and milk for cheese brings a lower price than either of the above. At times, and in certain localities, these conditions may be different. One should determine frequently, therefore, the prices being paid not only at local markets, but also at any other markets which may easily be reached. For example, in 1931, a Nebraska dairyman found that by shipping his cream to St. Paul, Minnesota, he could receive a net return of 4 cents more per pound of butterfat than he could obtain at his local market.

In many cases the handling of whole milk necessitates the use of trucks at a considerable expense to the producer, whereas cream, because of being less bulky, can as a rule, be easily taken to town by the producer in the family car while doing other errands. This is a saving which should be considered. Further, the skim milk left from the separating of the cream may be made to bring additional profit. One hundred pounds of skim milk fed judiciously to calves, pigs, or poultry has a feeding value equal to at least ½ bushel of corn. One hundred pounds of whole milk yields about 80 pounds of skim milk.

Occasionally the producer who is sufficiently experienced to maintain uniformly high quality may secure a special market. For example, he may obtain from a hospital, hotel, or restaurant, a standing order for sweet cream. Farms may produce certified milk or retail a special grade of milk at a price above that of the general market. This, of course, would necessitate facilities for bottling. Farm butter of high quality is sometimes furnished to regular customers at a considerable premium over the market price for creamery butter. In some cases making skim milk into cottage cheese and various milk drinks may be a way of increasing the farm income.

In many communities cooperative milk producers' associations are conducting the business transactions involved in the

supplying of milk to the distributing agencies in cities. These associations bargain with the distributors and perform several other functions, such as collecting payment for milk sold through the association, making or supervising the butterfat tests, setting the limits for the amounts of milk which any producer may deliver, paying the producers for their milk, etc. The chief value of the association is the securing of better prices, but there are many other benefits, such as more satisfactory butterfat tests and opportunities to reduce costs through cooperative hauling, purchase of supplies, etc. A milk producer should study carefully the opportunities afforded by joining or organizing such an association.

Good prices can be secured only when the product is of such high and uniform quality that the consumer realizes he is getting something worth a premium price. As a rule the consumption of high-quality products is stimulated when the supply is large. If low-quality products are found in great quantities on the market, and if the supply of the high-quality articles is irregular, consumers tend to substitute something else in their place. A surplus also depresses prices. One of the best aids in solving the surplus problem is to dispose of low-producing cows. The producer therefore plays an important part in helping to secure good prices.

MARKETING WOOL

Wool usually accounts for about one-third of the receipts from a flock of sheep. Under some conditions this return may represent the total net profit secured from the enterprise.

Management Problems:

1. Valuing wool.
2. Selling wool cooperatively.
3. Selling wool by other methods.

1. Valuing Wool.—In order to be able to market wool intelligently one should have some knowledge of the value of his wool on the basis of market quotations. Wool market reports

may be very confusing, mainly because the meanings of the terms used are not known. In the central wool markets, of which Boston is the leading market in this country, numerous terms are applied to wool. Some are more common and much more significant than others. Only a few of these terms, chiefly those affecting the commercial value of wool, can be explained here.

The price received for wool depends upon the differences found in the wool as well as upon the supply of wool and the demand for commodities made of it. Wool varies greatly in length, fineness, strength, condition, color, purity, uniformity, character, softness, elasticity, and in still other respects.

Length of wool determines the method which will be used in its manufacture. Long-fibered wool is combed; short-fibered wool is carded. In combing, the fibers are made to lie parallel; in carding, they are very mixed in directions. To be suitable as strictly combing wool, the fibers should be at least 2½ inches long. While length is a factor in valuing wool, it must bear a proper relation to other factors.

Fineness of wool refers to the size or diameter of the wool fibers. Short wools are generally finer than long wools, but wools of equal fineness may vary considerably in length. Fineness is the basis of *grading* wools, as length is the basis of *classifying* them. The terms for wool grades commonly used are fine, half-blood,[1] three-eighths-blood, quarter-blood, low-quarter, common, and braid. These are given in the order of finest to coarsest. Fine wools very often bring higher prices than the coarser grades because they can be used to make finer materials. Often at country points wools are simply graded as fine, medium, and coarse.

Strength, or soundness, in wool is necessary if it is to stand the strain of manufacture and wear. Unthrifty or poorly nourished sheep produce wool with weak fibers.

Condition in wool refers to the amount of extraneous material which may be present, such as grease, dirt, burrs, etc.

[1] The term "blood" has no special meaning in designating grades.

Such foreign matter must be removed from the wool in the process of manufacture. If wool is very dirty and filled with burrs the cost of processing it is greatly increased and the fibers may be damaged. During cleaning, or scouring as it is usually termed, wool may lose from 40 to 70 per cent or more of its weight as shorn. This loss is referred to as shrinkage. Hence two fleeces which have the same original, or grease, weight may vary greatly in value, for after scouring one may have lost not more than 50 per cent in weight while the other may have lost as much as 70 per cent. A certain amount of grease, or yolk, is desirable in wool as it keeps it in good condition.

Color is important, as only white wool can be satisfactorily dyed any desired color; hence black or other colored wools are worth less than the white.

Purity of wool adds to its value for manufacturing. When abnormal fibers, such as the chalky white fibers of kemp, are present, they do not take the dye the same as the wool fibers and are very brittle. Hence they reduce the value of the fleece in which they are found.

Uniformity in length and fineness of fiber is a most desirable quality in fleeces. No sheep, of course, grow the same kind of wool on all parts of their bodies, but some show much more uniformity than others in length, fineness, and other factors.

Character in wool refers chiefly to the crimp in the fibers. Wool of good character has an even, distinct crimp from the base to the tip of the fibers.

Softness and *elasticity* in wool make it possible to produce fabrics that possess these desirable features also.

2. Selling Wool Cooperatively.—The price received for wool sold cooperatively by strong selling agencies on the central markets is based largely on the above factors. It is an advantage to have wool sold on the basis of its actual value.

Cooperative wool-marketing agencies have existed for a considerable number of years in some sections of this country. The most aggressive plan for cooperative wool marketing in this country was sponsored by the Federal Farm Board. The

wool sold cooperatively is generally brought to a designated local shipping point on a certain day and then sent in carload lots to warehouses, where it is graded and later sold. The local shipping is often handled by a sheep-raisers' organization or by the farm bureau. The wool is weighed and identified as delivered by the growers and a record kept. After the wool is

Photo by Kaufmann & Fabry Co.

FIG. 102.—RECEIVING AND GRADING WOOL

Usually wool must be removed from the sacks after reaching the warehouse and be graded before it can be sold to mills.

graded, each grower is usually sent a report of his wool grades. When the wool has been sold, the net returns are sent to the local organization to be distributed to the consignors.

3. Selling Wool by Other Methods.—Up to the present time cooperative selling agencies have never handled in any year as much as 50 per cent of the wool grown in this country. If cooperative organizations are to be thoroughly effective, it will be necessary that they handle at least that percentage.

It should not be inferred from this that cooperative selling has not been beneficial. There is, however, great opportunity for expansion.

The large amount of wool not sold through cooperative agencies is handled (1) by selling to local dealers, (2) by selling to buyers for local mills or large manufacturers, (3) by selling to central market dealers, or (4) by selling through commission merchants on the large markets. Growers should study these methods, together with cooperative marketing, and select that which gives promise of the most net return and other benefits over a period of years.

COMMUNITY STUDIES

Marketing Meat Animals

1. What markets are most available in your locality and what are freight rates on each class of livestock to each market?

2. Visit the shipping point and observe the quality of the stock being shipped. In what respects will it fail to meet market requirements necessary to bring top prices? To what things are the inferior qualities of some of the animals due? To what things are the superior qualities of some of the animals due?

Marketing Purebred Livestock

3. Make a collection of advertisements of the different kinds of livestock. Arrange them in order according to their suitability for the purpose.

4. Prepare advertising material for purebred animals.

5. Visit farms on which purebred stock is produced and list the features which are used in selling surplus animals.

Marketing Draft Horses

1. Consult several farmers and find out the methods which they use in selling surplus horses.

2. Attend farm sales.

3. Visit the barns of a shipper.

4. Attend an auction sale at a central market.

Marketing Dairy Cattle

Visit the farms of several breeders of purebred livestock in the community and study their methods of disposing of surplus stock.

1. What is the general plan of disposal employed? Is it satisfactory?

2. Are the procedures suggested in this Chapter for keeping the herds attractive to buyers followed? If not, what are the procedures used and in what way, if any, could they be improved?

3. If there is a cooperative dairy cattle breeders' association in your community, consult the secretary regarding sales methods, guarantees of soundness offered by breeders, necessary tests before shipping, etc.

4. If possible, attend a public sale of dairy cattle and make notes of the methods followed.

Marketing Dairy Products

Visit the different dairy produce markets in your community, such as cream stations, condenseries, dry milk plants, etc.

1. Learn the rate of payment for milk. Which of the markets that are available to your farm offer the best returns?

2. What special regulations regarding bacterial count, tests of cattle, milk houses, etc., are required? Can your farm meet the requirements in order to take advantage of a better market?

Marketing Wool

1. Through what agencies do farmers in your community market their wool?

2. What are the most common criticisms of the wool grown in your community?

3. Would it be profitable or unprofitable to the producers to make necessary changes to improve the quality of the wool?

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PART IV.—IMPROVEMENT

CHAPTER XX

IMPROVING LIVESTOCK[1]

IMPROVING the efficiency of his animals is one of the most important problems confronting the livestock farmer. That improvement is desirable and possible is evident to anyone who compares the most efficient producing animal of any class with even the average for the class. To improve dairy cattle, for example, to the extent that the average production of all cows would equal the present highest production would be tremendous progress. It is impossible to foretell accurately the extent of improvement that is possible in any class of animals. The presence of exceptional animals in all classes, however, suggests that the factors for high and economical production already exist in the race if man can bring about their proper combination.

Inheritance of Characters.—The two characteristics of animal life that make improvement in any direction possible are its variability and its power to transmit characters from one generation to the next—heredity. If all animals of a given race were exactly alike in all their characters, improvement would not be possible, as there could be no choice among them.

Variation is the most constant characteristic of living things. As much alike, for example, as sheep appear to the average eye, each of the millions of them in the world differs from every

[1] Students will obtain a better understanding of this chapter if it is preceded by a brief discussion of the cell and the part it plays in inheritance. See Chapter 2 of "Breeding and Improvement of Farm Animals," by V. A. Rice (McGraw Hill), or Chapters 2 and 3 of "Animal Breeding," by L. M. Winters (John Wiley & Sons.)

other sheep in one or many of the characters that make up the individual.

Variations occur in all the characters of animals whether the characters are useful, of no value, or positively harmful. Variations are of two kinds: those that are transmitted from one generation to the next and those that are found only in a given individual. Non-inherited variations may add greatly to the value of an animal, but unless such variations are passed on to the offspring, they are lost upon the death of the individual. Variations in the amount of milk produced by dairy cows or wool produced by sheep, or the fleshing ability of cattle, sheep, and swine may or may not be able to express themselves in the posterity of the animal. Valuable as these variations may be in a given animal, they are not factors in progressive improvement unless they are transmitted to succeeding generations.

The skill of the breeder is shown in his ability to recognize, select, and perpetuate in his herd, from the many variations present, those characters that will make the animals highly useful for the purpose for which they are kept.

Unfortunately it is not possible to determine in advance the manner in which useful characters will be combined in the offspring of a given mating or the degree of development to which they will be susceptible. Hence, the ability to recognize early the appearance of useful variations of characters is essential to success. This ability comes only from a careful study of animals through several generations.

Mendel's Law of Inheritance.—The way in which certain characters are inherited is very definite and direct while the manner in which others are transmitted is very much less evident. Likewise, characters differ widely in the regularity and completeness with which they pass from parent to offspring. For example, the black color of Aberdeen-Angus cattle can be depended upon almost always to reproduce itself in the offspring whenever an animal of this breed is mated with one of any of the other common breeds. The black of Poland

China hogs, on the other hand, does not respond in a similar manner, since it shares its inheritance with the red of Duroc Jerseys and is completely subordinate to the white of Chester Whites in breeding. It is also true that factors that control functional characters, such as milk production, size, speed, and fleshing qualities, are seldom if ever recovered entirely in the offspring. This difference seems to be largely a matter of the complexity of the character involved.

The inheritance of many simple characters has been studied carefully since the development of Mendel's Law of Inheritance. In the simplest cases these characters, called unit characters, are either wholly present or entirely absent (to all appearances) except for certain modifying influences that at times affect them. One of the distinguishing features of such unit characters is that they reappear in their entirety and unmodified in succeeding generations. The regularity of their appearance and the ratio in which they appear are predictable. The simplest such case is a single pair of factors, called an allelomorphic pair.

Hornlessness in cattle seems to be controlled by a true allelomorphic pair of factors. Animals that are pure for the polled, or hornless, character, when mated with horned animals, produce offspring all of which are polled. The factor for the polled condition is said to be dominant; that for horns, recessive. The recessive character is not lost, but is merely hidden by the dominant. If these animals of the first generation, F_1, as they are called, are bred among themselves, one-fourth of their offspring, on the average, will be pure (homozygous) for the polled character; one-half will be impure or heterozygous, as they will carry factors for both the polled and the horned condition, even though they themselves will be polled; and the final one-fourth will be horned. The one-fourth that are pure polled and the one-fourth that are horned will, if mated to similar animals, continue to breed true for these characters. The one-half that are heterozygous, when bred among themselves, continue to produce offspring in the ratio of three that show the dominant

character to one that shows the recessive, just as their parents did. On the basis of actual breeding capacity the ratio is 1 : 2 : 1. These two ratios are illustrated below.

Characters visible: dominant character visible; recessive character visible

1 : 2 : 1

Actual genetic makeup of the animals: pure for the recessive character; heterozygous; pure for the dominant character

In case there are two independent allelomorphic pairs operating in the mated animals—for example, a dominant factor for hornlessness and one for black color—the presence (or absence) of both characters in pure form in the same individual will, on the average, occur in only 1 out of 16 offspring of a given mating. With three such factor pairs only 1 animal in each 64 will be genetically pure for all three characters; and for four pairs the chance is only one in 256 of recovering all the characters in a genetically pure condition in a single offspring.

Mendelism in its present state of development, therefore, does not seem to offer to the practical breeder a direct means of solving the many problems that confront him. It does, however, explain a few of the apparent inconsistencies of inheritance. Whereas formerly it was customary to suspect the Aberdeen-Angus cow that produced an occasional red calf of being of impure breeding, it is now known that both the cow and the bull must carry the factor for red before it can appear. As this is a recessive character, its appearance need not in any sense reflect upon the purity of breeding of the animals, since red animals are known to have been used in the early history of the breed. Likewise Mendelism suggests that to free the herd entirely from this trouble it is necessary to dispose not only of

the offending cows, but of the sire of the calves as well. Continued elimination of the red calves through a series of generations will ultimately free a given strain of this recessive character. For a similar condition that exists in Holstein cattle the same explanation and cure will apply.

Breeders of Blue Andalusian chickens are constantly troubled by the appearance of both black and white birds in blue flocks. This is now recognized as a necessary occurrence. These color relations are known to be an expression of a simple Mendelian pair of factors. In light of that knowledge, it is not disconcerting to find that the two parent colors segregate out when blue is mated with blue. These breeders might well make all three colors standard for the breed, just as Shorthorn breeders recognize red, white, and the heterozygous color, roan. While the colors of these two breeds do not respond exactly as a single factor pair, they do approach the expected ratio very closely and for practical purposes can be considered as such.

Attempts have been made to give a Mendelian interpretation to the inheritance of a large number of complex characters in farm animals. In most such cases the expected and actual results differ too widely to have much practical significance for the breeder of livestock.

Blending Inheritance.—If animal characters were all single unit characters in the strict Mendelian sense, improving livestock would be a relatively simple problem. Unfortunately, useful characters in farm animals, such as high milk production, rapid growth, and the like, apparently involve such a large number of factors as to make the combination of any particular set of them that control the extreme expression of a given character quite unlikely and entirely unpredictable. From the figures given in a preceding paragraph, it is easy to appreciate that characters that are controlled by even a relatively few factors would be practically impossible to isolate because of the large number of matings that would be required.

As a matter of fact, the useful characters of an animal seem to be more nearly the result of a blend of these same characters

in his sire and dam than the direct inheritance from one or the other. For example, the offspring of a ton stallion and a 1400-pound mare will be intermediate in size between the two parents. Likewise, a bull that carries factors for high milk production mated to scrub cows will beget heifers whose milking capacities will exceed those of their dams. From the standpoint of practical livestock improvement, therefore, a safe method of procedure is to retain for breeding purposes those animals from good families that possess in the most highly developed form the characters that make them most useful in the herd. Vitality and fertility, of course, must never be sacrificed.

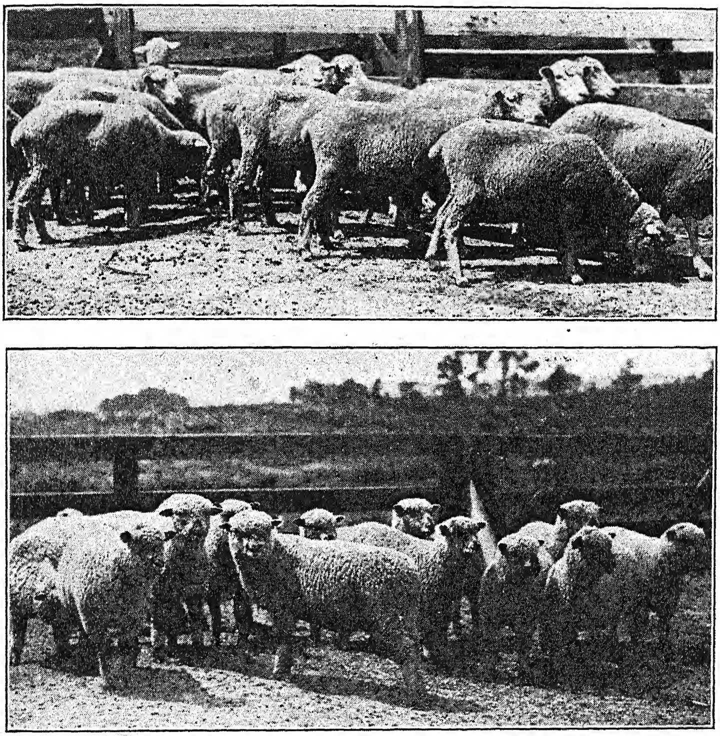
This method is likewise useful in keeping the herd free from unsoundnesses. Scrotal hernia in swine, for example, can be eliminated from the herd by refusing to breed any animals thus affected or their near relatives.[2] In fact, the improvement that has been accomplished in livestock since their domestication is principally due to this constant and long-continued positive selection *for* desirable characters and rigid selection *against* the undesirable. At present, science has no better method of livestock improvement to offer the practical breeder.

Individual, Herd, and Breed Improvement.—Livestock improvement programs may affect primarily the individual, the herd, or the breed, or race. What a given animal *may* become is determined at the time the male and the female cells unite to form the new individual. What it actually *does* become is a result of this inheritance modified by environmental conditions to which the animal is subjected during life. Environment can never make more of an animal than its inheritance allows, but it may easily, and usually does, prevent a full expression of the inherited capacity of the animal.

Individual animals can be improved only by improving the care and management they receive to the point that environment no longer acts as a handicap to their inherited capacity. For example, a beef steer may have been endowed by nature

[2] Warwick, B. L., Wis. Agr. Exp. Sta. Res. Bul. 69 (1926).

to gain at the rate of 3½ pounds a day, or a dairy cow to produce 100 pounds of milk daily. If they are fed an insufficient ration or submitted to other unfavorable conditions, they can not realize this inherited capacity.



Courtesy of University of Illinois

FIG. 103.—MOTHERS AND OFFSPRING

These lambs, sired by a purebred Shropshire ram and out of the Western ewes shown in the upper picture, illustrate the possibility of rapidly improving the mutton form of sheep.

Herd improvement is accomplished, so far as a herd is concerned at a given time, not only by improvement of the individual animals, as suggested in the preceding paragraph, but

by the actual elimination of low-producing and unprofitable animals. In practice, herd improvement by wise elimination offers more in the way of increased profit from a given herd than can be expected from individual or even breed improvement.

Improvement of grade herds may logically be extended to include the production of new generations of animals that will excel the parental generations. Progress in this direction is most rapid during the early period of improvement when production is relatively low. The improvement in such cases comes through the use of purebred sires carefully chosen to fit the requirements of the breeding program being followed.

Herd improvement has reached its highest development with dairy cattle in cow testing and herd improvement associations. Similar advancement is possible, however, with other classes of animals if suitable methods are applied.

The highest and at the same time most difficult improvement to accomplish is breed, or race, improvement as it applies to the purebred herd. The aims of individual and herd improvement are to eliminate the low-producing and inefficient animals and to provide for those remaining, herd conditions that will stimulate production of maximum economy. Breed, or race, improvement, on the other hand, aims to produce animals that will surpass any now in existence.

SELECTION

In any forward-looking breeding program no effort should be spared to determine in advance as accurately as possible the contribution to the herd that may reasonably be expected of any animal brought into it. Three types of information may be valuable in this connection: that to be obtained by a study of the animal itself; the performance of the animal, including offspring, in the case of mature animals; and the information to be obtained from a study of the ancestors of the animal.

Selection by Individuality.—Selecting animals by individuality presupposes a knowledge of the manner in which form

or type in animals is related to their productive capacity. To the degree that form and function are related can a study of the individual animal be relied upon to indicate its value. In a general way, form does indicate function, as is evidenced by the distinctive conformation of beef and dairy cattle, draft and race horses, wool and mutton sheep, and lard- and bacon-type hogs. Individual selection can frequently accomplish even more than this separation into type, as the high producers and desirable animals within a type can be separated with considerable accuracy from inferior and low-producing animals. Frequently, however, this method results in large errors that may prove costly since many very important differences that influence productivity cannot be distinguished by a study of the individual animal. Neither can its worth as a breeder be thus determined. Not infrequently the appearance of an animal is the only available basis for selection and this point emphasizes the desirability of being a good livestock judge.

The age and the conditions under which animals are developed are factors that may affect the success of selecting them by appearance. Productive capacity is very much more difficult to judge correctly in young than in mature animals. Excessive fat is also a handicap in selection, as it may hide even serious defects and make the animal more attractive than its real worth would justify.

Selection by Performance.—Selecting animals by performance eliminates all risk concerning their own productive ability. Unless the observations, however, have extended to their performance as breeders, there is still an element of uncertainty concerning the value of their offspring, for the characters that result in high production in any class of animals are transmitted with considerable irregularity. It is evident that the method can be used only to select mature animals. This limitation renders it of little value in maintaining a high standard of excellence in a herd or flock, since replacements in the average breeding herd must be made from the available young animals. The method can and should be applied finally to

each animal before it is given a permanent place in the breeding herd. In other words, it should be used as a final proving method for young animals that are selected by other means and as a basis of selecting mature animals to be brought into the herd or flock.

The conditions under which performance is measured may materially affect the showing made. A dairy cow, for example, that is milked three or four times a day and fed by an experienced feeder will reach higher production than the same cow would under less favorable conditions. On the other hand, a moderate record under average conditions is no guarantee of high production under extremely favorable conditions, as the inheritance of the animal may have found opportunity to express itself fully even under the less favorable conditions. In selecting an animal by performance, therefore, the conditions under which the performance was accomplished must be known.

Selection by Pedigree.—The selection of animals by pedigree is based upon the assumption that the good in animals reproduces itself. In general, this is true and the continued selection of good offspring from good parents through many generations has resulted in the elimination of a great deal of the element of chance involved. Even in highly selected strains and breeds, however, the percentage of cases in which inferior animals come from good parentage is so high as to constitute a real hazard. A study not only of the ancestors of an animal, but also of brothers and sisters will be found a great aid to selection.

A pedigree is merely a chronological tabulation of the ancestry of an animal. The value of a pedigree as an aid to selection depends first, of course, upon the truth of the pedigree and finally upon what is known of the quality of the animals that appear in it. Frequently, tabulated pedigrees are extended to give a brief statement of the merits of the various animals appearing therein. This practice is now almost universal among breeders of dairy cattle and has much to commend it. (See accompanying pedigree.)

The value of a meritorious animal in a pedigree depends

Pedigree of The Holstein Bull
Illini Homestead Piebe Prince
Registration No. 569148
Born: April 14, 1928

Sire
Prince Sylvius Ladoga, 356430
Sire of
Francy Abbekerk Ladoga, 7½ y.
Milk, 26,197. Fat, 988.5
Princess Ladoga, 4½ y.
Milk, 22,856. Fat, 889.4
Jessie Ladoga Posch, 3½ y.
Milk, 26,169. Fat, 748.9
Illini Ladoga Piebe Bonheur, 3 y.
Milk, 21,759. Fat, 735.4
Illini Ladoga Bessie Fobes, 2½ y.
Milk, 16,785. Fat, 653.7
Illini Ladoga Lady Agnes, 2 y.
Milk, 16,691. Fat, 532.5
Illini Ladoga Peep Agnes, 2½ y.
Milk, 14,714. Fat, 524.4 (305 d.)
Illini Ladoga Ormsby Beechwood, 2½ y.
Milk, 14,714. Fat, 492.6 (305 d.)

Grandsire
Prince Colanthus Abbekerk, 212547
Sire of
Lady Roberts Colantha, 3½ y.
Milk, 26,433. Fat, 1174.9
Oakhurst Colantha Abbekerk,
Milk, 25,817. Fat, 1060.9
Lady Norfolk Abbekerk,
Milk, 28,804. Fat, 942.2
Mollie Abbekerk, 3½ y.
Milk, 22,006. Fat, 800.0 (305 d.)
Colantha Posch Abbekerk,
Milk, 23,031. Fat, 749.5
Valetta Belle Abbekerk, 3½ y.
Milk, 21,441. Fat, 710.5

Granddam
Ladoga Idaline Mercena, 455693
Butterfat, 4 y. (7 d.) 22.8
Milk 630.5

Dam
Illini Homestead Piebe Bonheur, 714496
Butterfat, 2 y 712.2
Milk 20,508
Butterfat, 6 y 1,050.2
Milk 28,855
Dam of
Illini Ladoga Piebe Bonheur, 3 y.
Butterfat 735.4
Milk 21,759

Grandsire
Sir Bess Pietertje Piebe, 204840
Sire of
Illini Homestead Pietertje Veeman, 2½ y.
Milk, 16,319. Fat, 615.5
Illini Homestead Bess, 2½ y.
Milk, 18,826. Fat. 605.4
Illini Tritomia Pietertje, 2½ y.
Milk, 16,989. Fat, 581.1

Granddam
Illini Homestead Bonheur, 533531
Butterfat, 4 y 748.6
Milk 19,584

Fig. 104.—A Highly Instructive Pedigree

Information such as that included in this pedigree is the best indication of the breeding worth of an untried animal. The bare pedigree is of little value for this purpose.

very largely upon the position it occupies. Characters may, of course, come to an animal from any ancestor. The likelihood of any group of useful characters coming from a remote ancestor is very much less than is its coming from a parent or a grandparent. An animal has two parents, four grandparents, eight ancestors in the third generation, sixteen in the fourth, and thirty-two in the fifth, or a total of sixty-two ancestors in five generations. Each of these has contributed to the final makeup of the animal. The characteristics of animals that make them useful to man, such as size, rapid and economical growth, and high milk production, are not due to single factors in the genetic sense of that term, but to apparently complex combinations of factors. This complex is constantly being modified as it passes down the ancestral stream. It blends, so to speak, with other groups of characters from other lines of inheritance as they are added with each new generation. A group of useful characters that appeared five generations back of an animal, therefore, would find in its struggle to survive much more competition from other character complexes from the sixty-one other ancestors than would a similar set of characters appearing in the immediate parent or grandparent. In evaluating pedigrees, therefore, one should not be misled by the appearance of a few noted animals far removed from the one being studied.

Selection of Males by Progeny Tests.—One of the most difficult problems connected with livestock improvement is the selection of suitable males. This becomes increasingly difficult as the quality and production of the herd improve. The unfortunate selection of two or three inferior breeding sires in succession may have such serious results as practically to ruin the herd.

There is no known method of entirely eliminating this risk. It can be greatly reduced in herds where it is possible to breed a new sire to a few females of known breeding capacity and then hold him in reserve until the value of the offspring has been determined. In small herds and with slow-maturing

animals such as horses and dairy cattle, this may be very difficult, if not impossible.

The worth of a sire of known high-breeding merit is so great that once he is found he should be retained as long as he is fertile or until he must be replaced to prevent too close breeding.

The purchase and use of sires that have proved their value in other herds has much to recommend it. Because of the long time that must elapse from the purchase of a bull until the milk production of his daughters can be known, "proven sires" have a great economic value to breeders of dairy cattle. Their value, however, is by no means limited to this class of animals.

A knowledge of family characteristics is helpful in selecting both males and females. An animal of medium or even low production from a highly productive family may prove to be more dependable in the breeding herd than an exceptional producer from a family of low production. The tendency in any strain is to reproduce animals that approach the average for the strain, the offspring of animals far above the average being lower than their parents and those of the low parents being higher than their parents.

Selection Limited to Useful Characters.—Needless to say, selection in any practical breeding program should be limited to useful characters, such as prolificacy, vigor, quality, and economical production. To insist upon retaining various fancy points in animals unnecessarily complicates an already complicated problem. Assume, for example, that a certain useful character, say high milk production, is present in one-third of all dairy cows. Assume, also, that another character that is unrelated to milk production, such as levelness of rump, is present in one-half of all dairy cows and absent in the others. Only one cow in six, then, would possess both of these characters. To insist upon the presence of both characters would cut in two the chances of obtaining the useful character. Suppose, further, that a third character, an assumed one that

occurs in only a tenth of the animals, is insisted upon in addition to the other two. The combination of all three characters would then be found in only one animal in sixty. Fancy points retained at the expense of such fundamentals as fertility and vigor may wreck a breeding program. The consumer does not value a T-bone steak or a quart of milk because of some special color marking or shape of horn of the animal that produced it.

Of course, if one is breeding purebred animals, breed characteristics, which in a way may be regarded as fancy points, assume the position of useful characters since they are essential to the maintenance of the breed. Fortunately, most breed characters are well fixed so that they appear in practically all animals and therefore do not limit selection.

Always in selecting animals freedom from unsoundness and disease should be an absolute requirement. The consequences of not insisting upon sound and disease-free animals may range from the loss that may arise from the use of a blind sow to the wiping out of one's entire herd by some virulent disease. Just at present contagious abortion in animals that are being brought into the breeding herd should be guarded against particularly, because of the havoc it works and its present widespread occurrence.

SYSTEMS OF BREEDING

In establishing any livestock farming enterprise, one of the first questions to be decided is the system of breeding to be followed. Will the production be based upon purebred, grade, or crossbred animals? An animal is considered to be *purebred* when its two parents are of the same breed and are registered or are eligible to be registered by a recognized breed association. When a purebred animal is mated with one of mixed breeding, the offspring is a *grade.* When two purebred animals of different breeds are mated the offspring is known as a *crossbred* animal.

Purebred Breeding.—The purebred animal is the fountain head of all livestock improvement. These animals have been

purified, so to speak, through long generations of rigid selection which has set as its goal the elimination of all unsuitable characters. Because of this rigid selection, purebred animals are more dependable than animals of mixed breeding in the quality and uniformity of offspring they produce. It is likewise true that purebred animals respond better to good feeding and management than less carefully selected animals do. In spite of these advantages the large majority of animals will continue to be produced (and rightly) by grade females, though purebred sires should be used.

Purebred breeding, if properly developed, is the highest type of livestock improvement. It should be undertaken only by a select few who have the necessary personal characteristics, training, experience, and opportunity to carry it on successfully. Mere multiplication of purebred animals, desirable as it may have been in the early history of the breeds, no longer has any place in livestock production. Animals of practically as great commercial utility as purebreds can now be produced more cheaply in grade herds. Each generation of purebreds should be better than the last, so that they may become in truth dependable "seed stock."

Purebred breeders have a responsibility in this matter that they cannot shirk without affecting the very foundations of their business. It is their duty to see that unworthy purebred animals are not used for breeding purposes. Such males should be castrated and the females sent to market rather than held for a price that will be attractive to incompetent breeders. It is a shortsighted policy for a breeder to take advantage of the ignorance or inexperience of purchasers and sell them inferior animals. To do so will ultimately reflect against the purebred business and handicap the improvement of livestock.

Selection that is rigid enough to insure a good animal and the feeding and management required to develop it to the point where it becomes an attractive breeding animal, increase the cost above that of producing for market. The purchasers

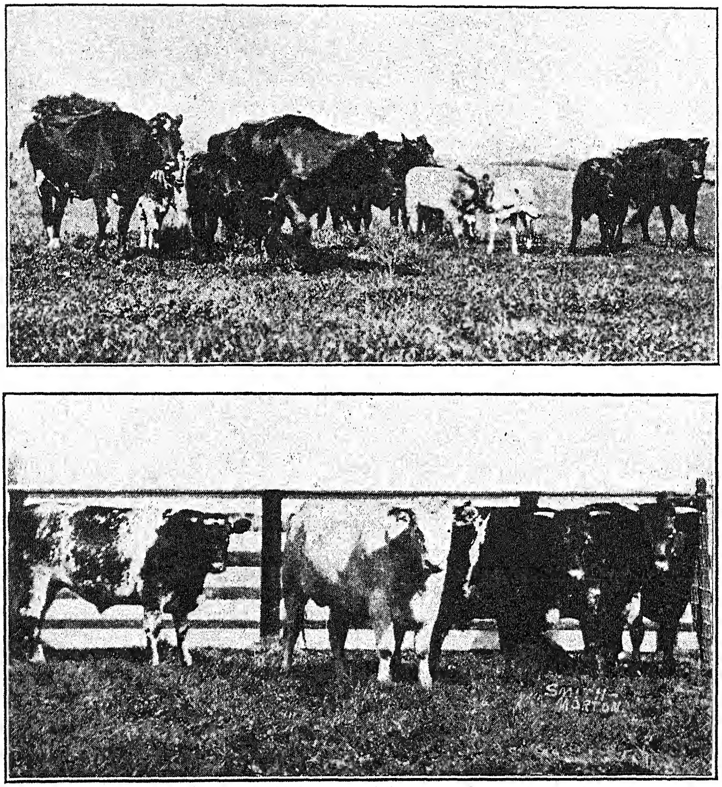
of good breeding stock will, in general, appreciate this fact and be willing to pay accordingly.

Usually a purebred business should be the outgrowth of a successful experience in the production of other livestock. By the purchase of an occasional good purebred female and continued careful selection of the males that are used, a purebred herd can be developed at relatively little additional cost over that of maintaining a herd of grade animals. The demand for surplus breeding stock should be one of the principal factors governing the speed of development of such a project, but the value of the herd from the standpoint of market production must also be given consideration. The purebred dairy herd that will pay its way on a milk and butterfat basis is on a much more substantial footing than is one that depends chiefly upon the sale of breeding stock for its profits. In like manner, the purebred herd of beef cattle, horses, sheep, or swine that can survive on a basis of commercial market production when necessary, reaps so much additional profit when animals are sold for breeding purposes.

Grade Breeding.—Livestock farming should be based largely upon grade flocks and herds. High-grade animals that are the result of careful selection and continued use of purebred sires can be made just as productive as purebreds. In fact, after five or six generations of such breeding, the animals become, for all practical purposes, purebred though they cannot be registered as such. Their growth and production are just as great and their offspring come to be practically as uniform as those of the purebred.

To maintain such a herd in a high state of development requires the continued use of carefully selected purebred sires and the rigid culling of all females that fall below the standard of the herd in individuality, production, or breeding capacity. In such a program there is no substitute for purebred sires. The grade sire or sire of mixed breeding cannot be depended upon to transmit his good qualities with the same regularity that can be expected of the purebred. The grade carries a

larger number of factors for inferior qualities which, when matched by similar qualities from the grade dam, may result



Courtesy of Sni-A-Bar Farms

FIG. 105.—IMPROVEMENT IN TWO GENERATIONS

In color, form, and ability to fatten, these calves closely resemble purebred Shorthorns, yet they are the result of only two crosses of purebred Shorthorn bulls on the lean, angular, native cows shown in the upper picture.

in less valuable offspring. The cost of improvement by grading up is very low. The good qualities of a single sire may be

transmitted to a large number of offspring in a single year. When the difference in cost of a good and a common sire is distributed over all his offspring, the cost of improving each individual is small indeed. The qualities of the good sire remain in the herd permanently in the females retained for breeding. Each succeeding sire thus uses all past improvement as a foundation upon which to build his contribution to the herd. The folly of occasionally changing the breed of the sire used, therefore, should be evident. Such changes result in the loss of a great deal of good that has been developed in a herd, often to such an extent that it means virtually starting at the beginning again.

Crossbreeding.—The advocates of crossbreeding claim increased vigor and economy of production for crossbred animals over purebreds of similar quality. In the strict sense of the term, there is almost no crossbreeding practice on livestock farms since by definition it is the mating of a purebred male and a purebred female of different breeds. Occasionally, however, a purebred male of a different breed from that represented by the grade females will be used in grade herds.

Crossbreeding is more or less regularly practiced in the production of range sheep in some sections of the West in an endeavor to increase the market value of the lambs. Usually the ewe flock is of grade Rambouillet breeding and is so maintained in order to retain the flocking instinct in the band and thus make their herding easier. Bucks of mutton breeding are used to increase the mutton characteristics of the lambs. The system is not without its drawbacks in practice and there is reason to believe that the practice would be largely discontinued if there were a breed of mutton sheep well adapted to range conditions.

Crossbreeding is not a common practice in beef-cattle or horse production. A few range cattle men feel that an occasional change in the breed of bulls they use increases the size of their steers. If any such effect is produced, the same result could likely be attained from using bulls of different type and

blood lines within the same breed. That such foreign blood is not a necessity is indicated by the fact that many of the best range cattle outfits use bulls of the same breed generation after generation.

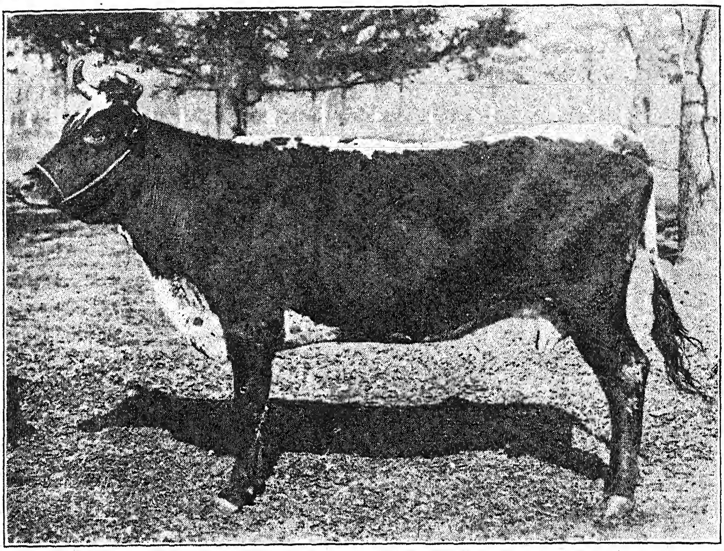
In some sections the practice of breeding grade sows to purebred boars of another breed is rather common. A carefully controlled study of the effect of crossbreeding swine upon their rate and economy of gain has been in progress for several years at the Illinois Agricultural Experiment Station. Nothing has come of this study so far that would support the belief that crossbred pigs are more vigorous or that they gain more rapidly or require less feed than purebred pigs of similar type and quality.

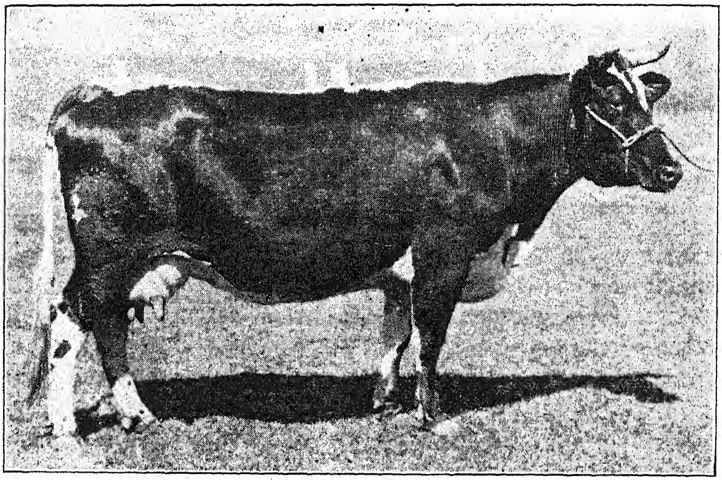
The use of crossbred animals for breeding purposes results in greatly increased variation in color, type, and quality. Such lack of uniformity in the animals is a handicap in marketing them. An even more serious objection to crossbreeding is that it is difficult to apply in practice. Either two separate herds of females must be carried else females as well as males must be purchased for the breeding herd.

Occasionally, one with a grade herd is confronted with the choice of breeding his females to an inferior male of their own breed or to a high-class male of another breed. Such a situation is most frequently met with mares or cows, where the cost of owning a sire may be out of proportion because of the small number of females carried. This is another illustration of the advantage of choosing a breed that is common in the locality. As a temporary expedient the lesser of the two evils may be to choose the better individual.

METHODS OF BREEDING

The degree of relationship existing between the male and female mated often becomes a matter of practical importance in a livestock breeding program. Mating of closely related individuals for a series of generations, such as brother and

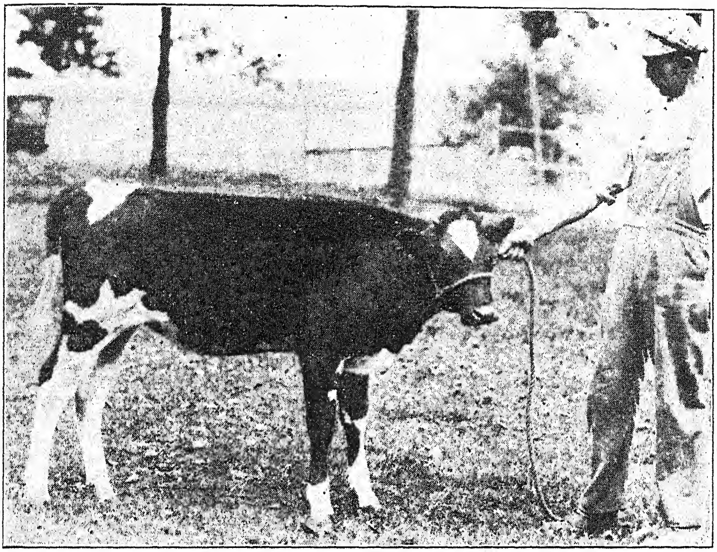


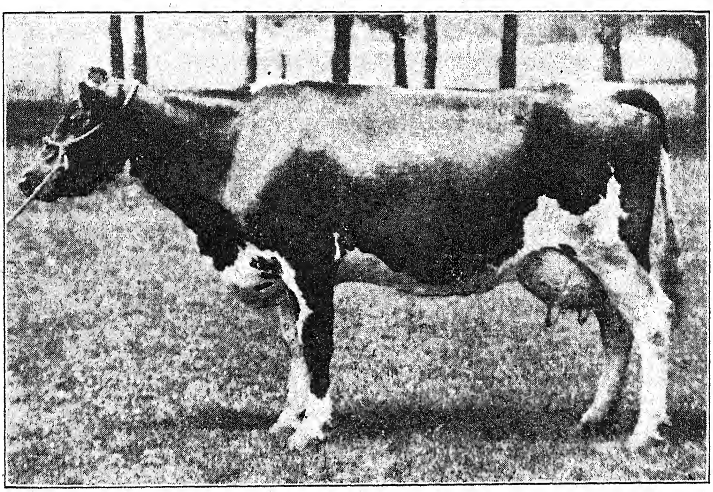


Courtesy of Iowa State College

FIG. 106*a*.—PROGRESS IN IMPROVING DAIRY CATTLE

Above and on the opposite page are pictured four generations, showing the gradual improvement which was brought about by the use of carefully selected Holstein bulls. Note the improvement both in conformation and udder development.





Courtesy of Iowa State College

FIG. 106*b*.—PRODUCTION ALSO IMPROVED

The record of the foundation cow of this family was 253 pounds of butter fat at four years of age; that of her daughter, 321 pounds at the same age; that of her grand-daughter, 322 pounds as a two-year-old, while the great-grand-daughter reached a production of 431 pounds of fat as a four-year-old.

sister or parent and offspring, has proved disastrous with all classes of farm animals with which it has been tried. Fertility has been reduced—in fact, almost destroyed—the vigor of the offspring has been greatly decreased, and occasionally monstrosities have been produced.

Inbreeding is the term applied to this breeding of closely related animals. Technically, an animal is inbred if a single animal appears more than once in its entire pedigree. Different degrees of inbreeding according to this definition are recognized in practice by the terms inbreeding, linebreeding, and outbreeding. Inbreeding is used to include such close matings as those of brother and sister, parent and offspring, and half-brother and half-sister. Any mating, in fact, of two animals carrying 50 per cent or more of the blood of a given animal is classed by some as inbreeding.

Linebreeding is the mating of less closely related animals, such, for example, as cousins. All matings of animals carrying as much as 25 per cent and less than 50 per cent of the same blood is designated by some as linebreeding. This term is used especially to denote the recurrence of the same animal in different generations of the pedigree.

Outbreeding, as the term implies, is the mating of animals of the same breed that are unrelated or only remotely related.

Close inbreeding is the most intense method of breeding known. Any set of characters can be fixed more quickly by its use than in any other way. In this respect it has been likened to a two-edged sword which will cut in either direction. It takes a large number of good characters to make an outstanding animal, while only a single unfavorable character sufficiently intensified will destroy or render it useless. The method was very successful in the hands of many of the early breeders, as is evident from a study of the pedigrees of the outstanding foundation animals of most of the breeds of livestock. Many of these animals were intensely inbred. There is, of course, no similar record of the disasters of inbreeding. The only conclusion that can be drawn from such one-sided evidence

is that inbreeding in itself need not always be ruinous. Illustrations of its successful application to livestock improvement can also be found in the records of modern breeders, though its use is not as frequent now as in the early days of breed history.

Close inbreeding will prove less dangerous, in general, in herds where blood lines have not already been concentrated. Frequently in the early development of grade herds the qualities of an outstanding sire can safely be concentrated by mating him with his daughters or granddaughters. There is no way of predicting the results of such matings, since so much depends upon the individual animals. If undertaken at all, therefore, it should be on only a small scale at first, and with the realization that failure may result. If such matings do prove successful the resulting improvement is frequently very marked, as the method promotes uniformity and a high degree of prepotency in the resulting animals.

Linebreeding attempts to conserve the good of an animal or family by a somewhat slower process than inbreeding. If followed consistently it will work the same improvement in a herd that comes from inbreeding. As a compensation for the longer time required the possibility of disaster is almost completely removed. Carefully selected line-bred animals ultimately acquire the uniformity and prepotency characteristic of inbreeding.

Outbreeding, on the other hand, has a tendency to increase variability. Even when the animals mated possess many characters in common, it is more difficult to maintain uniformity in the herd with outbreeding than with inbreeding or linebreeding. A skillful breeder may in spite of this be able to develop sufficient uniformity in an outbred herd or flock to make it attractive and successful.

A method of breeding is not an end in itself, but only an order of procedure. The end is progressive improvement of a herd of livestock. One should keep this in mind and not become a slave to any method. A method is useful in a given herd only if it produces the desired results. At best there is a

considerable element of uncertainty in the results of breeding which no method can overcome. Success is most apt to crown the efforts of those who develop sufficient insight into animal nature to enable them to detect more fully the possibilities which lie dormant in their animals.

COMMUNITY STUDY

1. Locate at least one outstanding sire of each class of animals in your community.

    (*a*) By what method did the owner select him?
    (*b*) Tabulate a pedigree of each sire to the fifth generation, from the breeder's records, sale catalogs, or even by writing to the breed associations for the information.

    Study the pedigrees carefully and see if you can determine what makes the sire prepotent. If the explanation is not to be found in the pedigree, could it be in the quality of females with which he has been mated or in the feeding and management his offspring have been given?

2. Locate at least one herd of livestock the productivity of which has been greatly increased during the last 5 or 10 years.

    (*a*) Tabulate what seem to be the significant changes in breeding, feeding, and management that have contributed to this improvement.

3. Make a survey of your community and determine the percentage of the sires for which the owners have certificates of registry.

4. What improvements do you feel are desirable and possible in the cattle, horses, sheep, and swine in your community? What seems to be the most feasible method of making these improvements?

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CHAPTER XXI

EXHIBITING LIVESTOCK

LIVESTOCK exhibits have long formed an important feature of agricultural fairs. Here breeders and feeders are afforded an opportunity to have their animals rated by experienced judges and thus learn what progress they have achieved in the improvement of their flocks and herds. Competition brings out differences, and not infrequently animals which at home appeared to be "world-beaters" lose much of their luster when placed alongside other contenders before the judge. The showing of stock makes business both through actual sales at the show and through furnishing desirable contacts with prospective purchasers. Winning important prizes at strong shows makes sales easier and prices higher.

Management Problems:

1. Selecting animals for showing.
2. Making the entries.
3. Feeding and fitting.
4. Training and schooling.
5. Grooming for the show ring.
6. Showing the animal.

1. Selecting Animals for Showing.—Naturally the animals selected for exhibiting should be among the best in the herd. However, it should be recognized that putting an animal in high show condition may seriously impair its breeding ability, and also that transporting it to and from the fairs exposes it to considerable risk from injury and contagious diseases. Hence the prudent breeder will refuse to exhibit animals the injury or loss of which would seriously jeopardize the future progress

of the herd. As a rule, the show herd should consist largely of young animals which, because of the rapid growth they are making, can safely stand strong feeding and which more truly represent the salable surplus of the herd than would mature individuals. The exhibitor's success depends to a considerable extent on his accuracy in visualizing what time and fitting will do for the young animal, the thin one, and the one "in the rough." Through observation and study, ability in this respect should be cultivated as much as possible.

Obviously the animals chosen should be of the approved or popular type, as the judge, in so far as possible, will confine his awards to entries which most nearly meet present-day standards of perfection. Moreover, animals so chosen will present an even, uniform appearance, both in their stalls in the barn and in the ring when shown together for the group prizes. Uniformity indicates not only care and attention in the selection of the show animals themselves, but also adherence to a fixed type or idea in the breeding and improvement of the home herd. Consequently a uniform exhibit of good animals is one of the best evidences of constructive breeding.

In selecting animals for the show herd, consideration should be given to size and age. Animals which are of good size and well developed for their age are nearly always chosen by the judge for the better prizes. Hence, especially in the younger classes, animals born soon after the dates which separate the various show classes have a marked advantage over those which are born several weeks later.

2. Making the Entries.—Catalogs or premium lists of nearby fairs should be obtained several weeks in advance of the opening of the fair season and a careful study made of the classification and prizes offered by each. Attention also should be given to the size of the entry fees and the amount charged for pen or stall rent, exhibitors' tickets, and other incidental expenses. Fairs at which there is little prospect of winning sufficient prize money to cover expenses should be passed by for those which offer larger premiums or more adver-

tising advantages. All rules pertaining to the dates for making entries, the vaccination of animals, etc., should be studied and steps taken in good time to comply with such regulations as must be met before the actual opening of the fair.

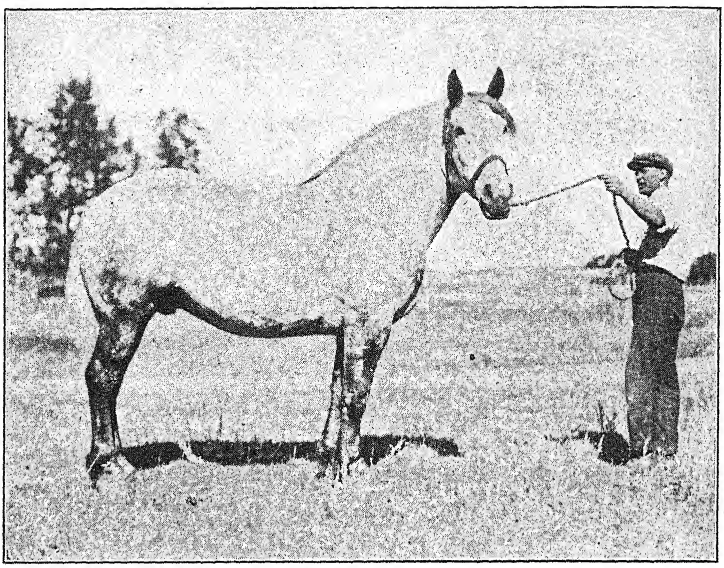
3. Feeding and Fitting.—To give an animal the flesh that puts it in acceptable show condition requires somewhat longer than to put on an equal gain for the purpose of marketing, for if the fat is to be laid on evenly and smoothly, it must be done fairly gradually. To have an animal reach the bloom of a good finish just at the date of the fair and not be stale or overdone requires experienced judgment. Older animals are somewhat more difficult to fit than youngsters, but even with the latter the start should be made early, since growthiness and size for age are essential.

Rations for animals that are being fitted for show need differ very little from those recommended for fattening the same class of stock for the open market. Usually it is well to provide greater variety in the ration than would be justified for market stock. Ground feeds, appetizing supplements, and whole milk can frequently be used to advantage, and feeding three or four times a day may be employed to add the necessary few pounds of weight. Close attention to the individual appetites of the animals is necessary if the job is to be done without throwing them "off feed."

4. Training and Schooling.—Skillful showing depends largely upon the thoroughness and care that has been given the training of the animal during the period of fitting. Animals should be taught to pose and move in response to the desires of the showman, and until they are thus completely under control they are not ready for the show ring. Nothing is more likely to injure an animal's chance of winning than to have it become unruly in the ring. Weeks of careful feeding and skillful grooming may easily be lost by failing to have the animal so well trained that it is under control at all times.

Training, like feeding, requires time and cannot be given in large "doses." A few minutes spent each day in teaching

the animal to stop or move in response to a touch of the whip or cane will accomplish the desired end. Show animals should be accustomed to the presence of strangers, to automobiles in motion, and to other conditions likely to be encountered. Use gentle measures and secure the confidence of the animals. Do



Courtesy of George Lane

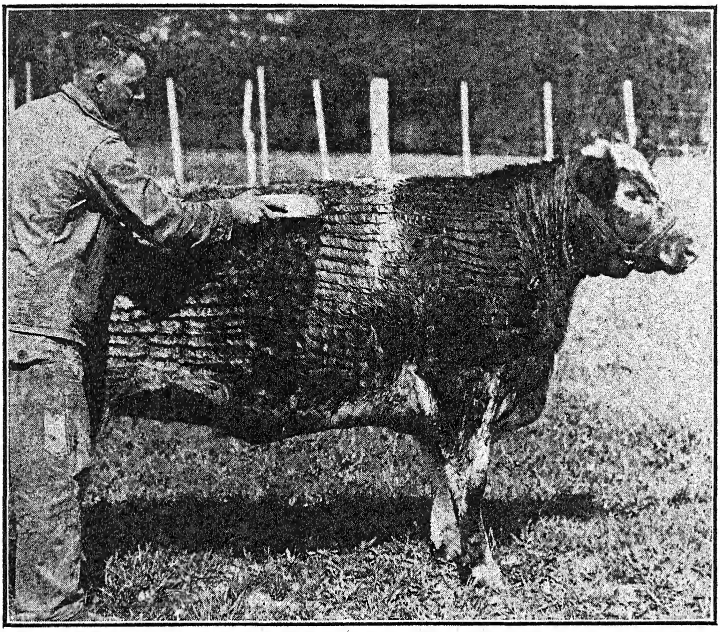
Fig. 107.—The Effect of Position upon General Appearance

A really high-class show gelding which in this picture appears to be low in the back and noticeably deficient in set of hocks and length of pasterns. Had the horse been stood with his front feet about one foot farther forward and on slightly higher ground the high merit of the animal would have been revealed.

not strike them unless absolutely necessary, for it may cause them to become easily frightened and unmanageable.

Watch animals being shown at some of the leading shows and also study photographs of individual show or sale animals. Note the poses taken. Train horses and cattle to assume these

poses quickly and to retain them for ten minutes or more at a time. Study each animal to learn the position in which it presents its best appearance. In case an animal has a defect of some kind, train it to stand so that the defect will not be exaggerated. If it has a low back, for instance, train it to



Courtesy of U. S. D. A.

FIG. 108.—ADMINISTERING THE FINAL GROOMING, COMMONLY SPOKEN OF AS "CURLING," FOR THE SHOW RING

keep its feet placed squarely under the body and do not permit it to stand in a "stretched" position. Such training requires a great deal of time and patience.

Daily exercise is an important part of the fitting of an animal for the show ring. It gives it the firmness of flesh and the ease of walking that are essential to success. Also, it has value in keeping the appetite of the animal keen and uniform.

5. Grooming for the Show Ring.—Grooming should give a natural bloom and finish to an animal and not appear as a bit of last-minute make-up put on in an attempt to cover up defects. Throughout the fitting period the coats of the animals should be kept clean and in good condition. All animals should be brushed daily and all except sheep and horses should be washed occasionally. The bedding should always be clean and dry so that unsightly manure stains may be avoided.

The final grooming of the animal before the show is the climax of its fitting. It brings out and places on display, so to speak, the qualities that have been built up by fitting. The coat must be given its final cleaning, brushing, and oiling; clipping and curling must be done to insure trimness of line and emphasize desired conformation; feet must be trimmed; horns and hoofs polished; and various other details taken care of which will make the animal appear to its best advantage. Practices in fitting or showing which deceive the judge and the public lower the moral standards of the showman and in the long run react unfavorably upon him as a breeder. Such practices also defeat the purpose of the show ring. Every animal should win upon its merit and not upon trickery.

6. Showing the Animal.—When an animal is being shown, the judge should be given an opportunity to see it at its best. The attendant should be neatly dressed, preferably in a uniform or in white shirt and trousers. A slovenly showman greatly detracts from the appearance of an entry. Above all, the attendant should be prompt in getting the animal into the ring, and should comply readily with any request of the judge or superintendent. The animal should be kept at its best all the time it is in the ring, even though the judge for the time being may appear to be devoting his attention elsewhere. Otherwise, he may turn suddenly and find the animal in a bad position.

Be as good a loser as you are a winner. Remember, the judge has but one first place to award in each class. His judgment is likely to be better than yours because it is not biased in favor of any animal. In any event, his decision is final and to

disagree with him can do no good and only marks you as a poor sportsman.

FITTING AND SHOWING DAIRY CATTLE

Animals in a good condition of flesh present a better appearance in the show ring than thin animals. Extreme fatness, however, should be avoided, since it is apt to cover good dairy tendency and to make the cows look beefy.

In fitting dairy cows for showing, a limited amount of pasture is desirable, but free access to fresh green, watery grass must not be allowed. Provide liberal amounts of legume hay together with moderate amounts of silage. Grain mixtures having a total protein content of 12 to 14 per cent and containing a number of different feeds are suitable. Sufficient amounts should be given so that the animal has a smooth covering of flesh by show time. In order to increase consumption the grain mixture should be moistened before feeding. For this purpose water or from a pint to a quart of molasses diluted with water may be poured over the grain mixture just before feeding. In the case of both heifers and bulls up to 18 months of age, the grain mixture for each feeding may be emptied into a gallon of skim milk and given as a slop. Sliced mangels and carrots and soaked beet pulp also help to keep the appetites keen. As soon as the animals have reached a good state of flesh, omit corn from the grain mixture and reduce the amounts fed to a low point. Overfat animals become patchy.

In preparing dairy cattle for showing, clipping is usually practiced. It gives a smooth, neat appearance to the animal and emphasizes its dairy tendencies by increasing the apparent sharpness of the withers, dish of the face, fineness of the tail, etc.

Ayrshire breeders clip only the heads, necks, and tails of show animals. In the case of the other dairy breeds, mature animals having rough, patchy coats should be clipped over the entire body six to eight weeks before the first show. The final clipping should be done after the animal has reached the proper state of flesh. Young animals may be clipped within a week

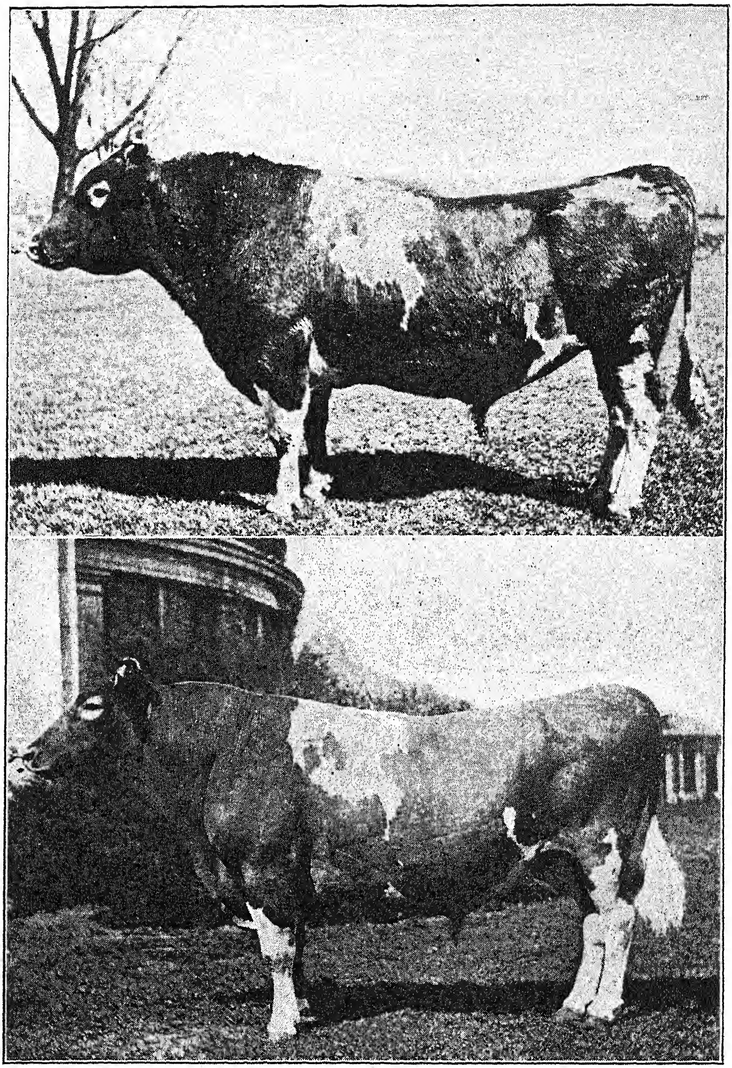


FIG. 109.—EFFECTS OF CLEANING AND GROOMING

The lower picture, taken at an interval of only one week after the upper, shows the marked improvement in appearance brought about by clipping, scrubbing with soap and water, and regular grooming. The scaly condition of the neck and shoulders and the bare patches of hide on the rump are scarcely noticeable in the lower picture.

of the show. All animals having even coats of hair may be clipped only on head, neck, withers, along the back and underline, and on the tail. In clipping these particular areas, the projecting points of the body should be clipped closely and the hair left long over the depressions, so that an appearance of straightness and smoothness is obtained. The withers should be given a sharp appearance, and the dish of the face increased by clipping closely in the center, leaving the hair a little longer toward the eyes and poll. When the entire body is not clipped, great care must be used to blend the clipped area into the unclipped.

One or two days before the show the cattle should be thoroughly scrubbed with soap and water to remove all traces of dirt and stains. All that will then be necessary for their coats before they are taken into the ring is a thorough brushing and a rubbing down with a cloth having a trace of thin oil.

During the fitting period and the show season, blanketing helps to soften the hide and hair and protects the animal against flies and cold drafts. For this purpose light-weight duck or burlap blankets may be used in summer and lined blankets for late fall and winter.

The horns of animals less than 18 months of age sometimes may be greatly improved in appearance by the use of horn trainers. Jersey horns should curve inward while Ayrshire horns should curve upward and backward. Study the photographs of leading show animals of the breed with which you are working to learn how the horns of your animals can be improved.

Smooth, polished horns add to the appearance of animals in the show ring. When horns are coarse and rough, use a small wood rasp on them, and scrape with a piece of glass. Then smooth with coarse and fine emery cloth. Apply a thin coating of polishing paste made by mixing tripoli powder and sweet oil, and rub vigorously with a strip of flannel cloth held taut between the hands. A thorough polishing will last for many weeks with only an occasional rubbing up.

The hoofs should be smoothed and polished in much the same way as described for the horns.

Cows in milk are shown to best advantage with full udders. Remove just enough milk on show day to keep the udder well filled but not so hard that it will become caked. Keep animals a little hungry that day in order to make them more active.

Animals deficient in middle should be given a good fill of water an hour before taking them into the ring, but care must be taken not to give them so much that they become lopsided. In winter, water should be warmed to prevent the animals from shivering and humping.

The attendant should wear a neat, clean uniform or be dressed neatly in white shirt and trousers with black tie and black belt. A slovenly showman detracts from the appearance of the entry.

FITTING AND SHOWING BEEF CATTLE

Much stress is placed upon condition in judging beef cattle. Should an animal be even slightly deficient in finish, it will be suspected of being so lacking in feeding ability that it could not easily be made any fatter; or that if made fatter, it probably would become rough and patchy. Hence, cattle that are to be shown should be fed liberal amounts of high-quality concentrates for several months preceding the opening of the show season. Coarsely cracked corn probably should form from 50 to 75 per cent of the grain ration until the animal is in at least good market condition. After that time barley, oats, roots, and bran should gradually replace half of the corn. Such feeds usually will impart a smoother, more mellow covering of flesh than can be attained from a heavy corn diet.

A day or so before the show the animals should be thoroughly scrubbed with soap and water. Cattle with long, fluffy hair are usually "curled" a short time before being taken into the show ring. The method of curling employed varies with the length of hair, the conformation of the body, and, to some extent, with the breed of animal shown. Instruction in such

matters can be obtained best by serving an apprenticeship under an experienced herdsman for one or two show seasons.

Short-haired animals are brushed down smooth and then rubbed briskly with a woolen cloth slightly dampened with a mixture of equal parts of denatured alcohol and sweet oil.

In the case of horned cattle, attention should be given to the horns as well as to the coat. Often they will need some training to give them the proper shape.[1] A week or two before

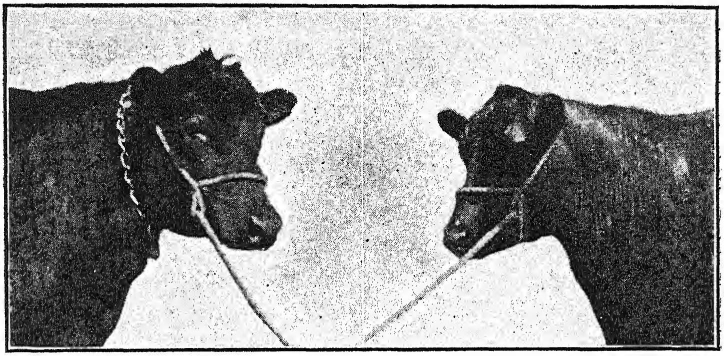


FIG. 110.—AN ANGUS HEAD BEFORE AND AFTER CLIPPING

Clipping the heads greatly improve the appearance of short-haired cattle. As a rule, clipping is practiced with Aberdeen-Angus and all the dairy breeds.

the show they should be smoothed with a rasp or coarse sandpaper and afterwards polished with emery cloth. Finally, just before showing they should be rubbed briskly with a woolen cloth bearing a few drops of furniture wax or metal polish of good grade.

FITTING AND SHOWING DRAFT HORSES

Draft horses, to be successful in the show ring, must be shown in rather high condition. While it is true that "fat covers a multitude of sins" when referring to the body, it is

[1] Cf. page 292.

still truer that it takes quality bone and correctly-made joints to stand heavy fitting. It is important that the "underpinning" be right to start with. Feed is wasted on round-boned, puffy, weak-jointed individuals, because high feeding and consequent heavy weights cause these infirmities to become more pronounced.

Show stuff should be shown "in bloom"; that is, it should be at its best in every way. In close competition it is the "extra touch" that counts. Feet must be well grown out and properly shod. Shod feet appear larger and show better action. Just previous to entering the show ring use neat's-foot oil, or this oil with lamp black added as a hoof dressing. Apply with a small paint brush. The coat, mane, and tail must be clean and glossy. Draft horses are usually fitted without much use of blankets. Manes and tails are usually decorated with bright yarn or bunting and ribbons. These finishing touches of course add nothing to intrinsic value, but they do add to attractiveness. (See page 317.) Cotton-cord rope halters usually look best on well-trained mares and foals of both sexes. Stallions are shown in bridles. A supple chain under their jaws aids in control. For draft horses shown in harness, heavy brass-mounted harness and Scotch collars are in order. Wagons should be newly painted and clean.

Horses shown in hand must be taught to stand "at attention," heads up and feet squarely placed. They should not be allowed to stand all "bunched up" or inelegantly stretched out of shape, although some degree of the latter positions may be necessary for the high-hipped horse or the one with crooked hindlegs. No horse looks well standing down hill or with his front feet in a low spot. Preferably his front feet should be a little higher than his hind feet. This is especially true if the individual is low-backed.

Teach promptness at the walk and trot. When turning, the groom on the lead strap should turn to the right. This gives him a better chance to steady his charge and bring him back to the judge on a straight line. When competition is close,

remember that the horse that is poorly shown usually loses its chance to win. More shows are spoiled by the whip than are helped by it, and yet horses in this country are usually shown in hand with considerable cracking and flourishing of long lash whips.

Foals should not be led into the ring without proper training. A nervous, "green" foal appears at a great disadvantage and is a menace to the safety of the people and other colts in the ring.

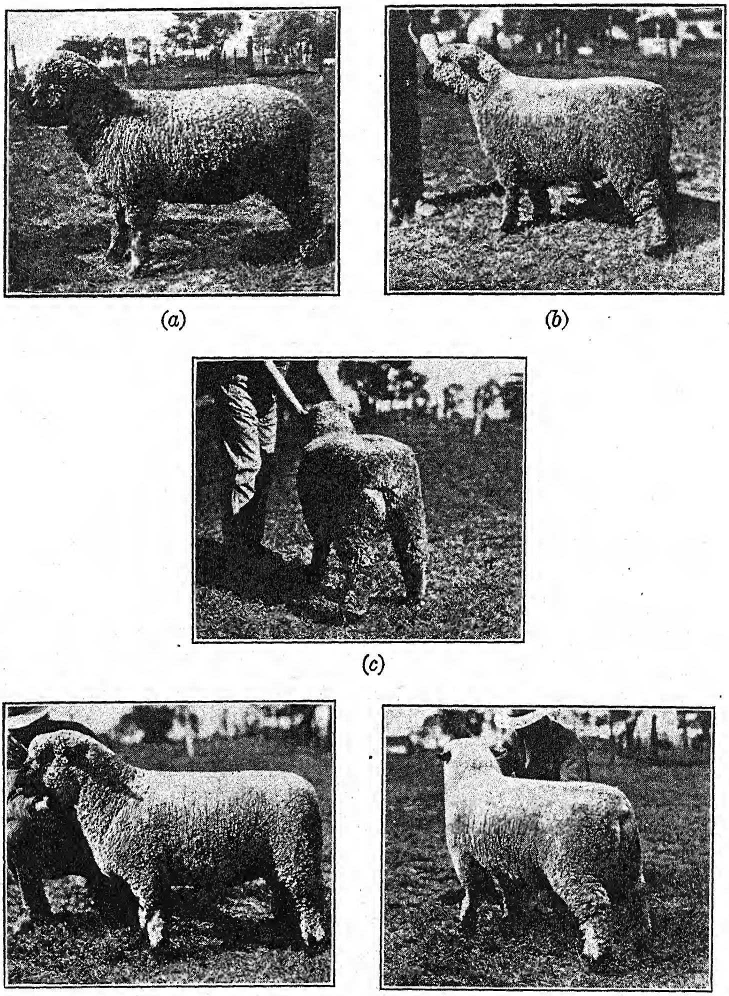
Horses shown in harness should be schooled until they are clever at both walking and trotting; at turning and backing. The music and confusion usually attendant at the show ring necessitate harness horses being thoroughly broken.

FITTING AND SHOWING SHEEP

Choice, palatable feeds are indispensable in conditioning sheep and lambs for the show ring. Farm grains supplemented with bran and linseed meal should be fed liberally together with legume hay, cabbage, and mangels to keep the digestive system in good order. Avoid getting sheep too fat, as heavy deposits of loose, blubbery fat over the ribs and about the dock are a serious defect in show sheep.

Sheep which will probably be used in the show flock may be shorn early in the spring so that their wool will be sufficiently long by midsummer to permit considerable trimming or blocking. If the fleece is dirty or badly soiled, the sheep should be given a good bath about two months before the show to remove all dirt and stains. It should then be kept blanketed to aid in keeping the fleece clean and in restoring sufficient yolk to give it proper condition.

Before starting to trim a sheep, one should study it carefully to determine in what way its merits can be best brought out. Care should be taken not to remove too much wool from any part of the body, for it will be an easy matter to remove more at a later date but impossible, of course, to restore that already cut off. The better way is not to attempt to finish the job at one time, but to trim a little at intervals of several days, mean-



(a) (b)

(c)

(d) (e)

Courtesy of University of Illinois

FIG. 111.—BLOCKING AND TRIMMING FOR SHOW

Skillful fitting and trimming are important in preparing show sheep. Note the improved appearance of this lamb as it passes through the successive steps which prepares it for showing.

while studying the animal to decide what further improvements in appearance can be made.

The detailed steps of trimming are too complicated to be taught satisfactorily through the printed page. They can be learned well only by observing an experienced shepherd in the preparation of his show flock, and then practicing on ordinary animals before the trimming of a show prospect is attempted.

The method of holding and leading a sheep in the show ring should be as described in Chapter XVII (see page 329). While the sheep is being examined by the judge, the attendant should stand at the left shoulder of the animal with one hand under the jaw.

FITTING AND SHOWING SWINE

The proper degree of finish for hogs that are to be shown in the breeding classes is sometimes difficult to attain, since mature animals tend to become too fat in the fitting process while pigs under 6 months of age are difficult to get fat enough. Both should be in high enough condition to present a plump, smooth appearance. Barrows should be more highly finished than breeding animals.

Rations for fitting animals need differ little from those used for fattening purposes. (See page 215.) The value of good pasture, however, should be especially stressed in fitting hogs for show, not only for its nutrients, but because it encourages exercise, which is so essential at this time. The last few weeks before the animals are to be shown they should be turned on pasture only at night or on cloudy days to keep their coats from getting sunburned.

One or two days before the show the hogs should be scrubbed with soap and water to remove all traces of dirt and scurf from the skin. Following drying, a little clean oil should be brushed well into the skin and hair. All that then will be necessary before the animals go into the ring will be a thorough brushing and a final rubbing with a cloth containing trace of thin oil.

Heavy oiling should be avoided since it defeats the very purpose for which the oil is used, namely, to give the skin a soft, clean appearance and the hair a natural gloss. The use of lamp black in the oil applied to black breeds, a practice that some resort to, is especially to be condemned. It is totally unnecessary and adds nothing to the finish of the coat, but rather gives it a "messy" appearance.

The skillful use of a little talcum powder on the "white points" of black breeds emphasizes the natural contrast of these areas. Rather than be overdone, however, it better be omitted entirely.

Occasionally the white breeds are not oiled after they are washed. Instead, talcum powder is brushed evenly into their coats just before they are taken into the ring. A clean skin and a natural gloss to the hair put on with the oiled cloth as described above is usually to be preferred to a method that is so obviously artificial as the use of large amounts of powder.

A trimness of appearance can be given by clipping the ears and tail, with the exception of the bush on the end of the tail. The toes should be trimmed whenever this is necessary to keep the feet and legs straight. As a finishing touch the hoofs should be cleaned and polished.

The object to be sought in showing a pig is to give the judge an opportunity to see it at its best. To permit this the animal should be be under control at all times, as already mentioned, so that it may be posed or moved as the judge may direct. To lose control of the pig even for a moment may result in failure to win a place. Chasing a pig about a show ring—an all too frequent procedure—has none of the elements of showmanship about it. Even junior pigs can be trained to pose or move as directed. To prevent the older boars from fighting in the ring a small hand hurdle is almost necessary.

Continually crowding a judge in an attempt to force his attention to your animal is entirely useless as well as discourteous. A much better plan is to keep your eye on the judge and have your animal in an advantageous position whenever the

judge wants to see him. No judge will overlook animals that are shown in this manner.

FARM AND COMMUNITY STUDIES

1. Obtain premium lists and catalogs of fairs easily accessible to the breeders of your community and study the rules and prize lists of each. Compute the net winnings (total prizes less entry fees, stall rent) possible with a full herd of the breed of livestock in which you are most interested.

2. Visit a breeder-exhibitor and note the general type and other characteristics of the animals selected for show. Also observe the methods of feeding and fitting used.

3. Let each student who has fitted and shown one or more calves, pigs, or other animals in club shows describe the method of training and fitting which gave best results.

4. Visit a nearby fair and observe the methods used by the various exhibitors in giving the final grooming for the show ring.

5. Observe the judging of two or three rings of animals, noting the work of the judge; also compare the entries as to general appearance, show ring manners, and general merit.

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